RAILROAD GAZETTE

FRIDAY, JULY 17, 1903.

CONTENTS

Contributions

Who Taught Walking Delegates to be Bad?

Elkins, W. Va., July 8, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Dear Sir.—Referring to your recent severe articles on the crimes and misdemeanors of trades unions and those who act under their cover and guise, I beg that you will kindly permit me to ask who taught these men that "right" was a thing to be obeyed by fools only, and that laws were to be despised, evaded, or trampled on according to one's power, ability and opportunity? Have not the men of brains, culture and money largely done this? Your own columns have often contained evidence of this. Why not devote more of your attention to the original authors and exemplars of crimes against law and equity. What "right" have those who laugh and sneer at right, law and duty to appeal to right, or what ground to hope that such appeal will be heeded?

INQUIRER.

[It is an easy and correct answer to say that no one "taught these men that right was a thing to be obeyed by fools only." That state of mind is a barbaric condition which is simply one of the stages of progress from brutes to something better. It is also true that all men and corporations have a right to the protection of the law, whether or not they "laugh and sneer." The implied idea in the correspondent's last question is that any man or body of men may set up as judges and decide upon the quantity of sneering which disqualifies a man from receiving justice. This is anarchy.—EDITOR.]

Solid Gas.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The elasticity of gases is due to the rapid motion of their particles or molecules, the velocity of which is increased or decreased, according to the degree of temperature and of pressure to which they are submitted. The tendency of pressure is to reduce molecular activity, while the heat, generated by compression, will increase that velocity. Hence two forces, heat and pressure, which will counteract each other for a preponderance over the molecules. When these two factors counterbalance each other, there is an equilibrium, the gas is in its normal state.

A gas is condensed by compression and elimination of the acquired heat. According to the degree of pressure, a gas may be gaseous, semi-liquid, liquid, semi-solid (under crystallized form), and solid. When solid, it is as hard as steel. The crystallization is but an expanded form, an oxidation, from which, by electrolysis, the final solid can be reached. Whatever may be the pressure on a gas, it will not liquefy it, until the critical point has been attained. The critical point, or critical temperature of a gas is a point of temperature above which a gas cannot be reduced to the liquid state. This critical point varies for each gas. For that reason complex gases, like air, which contains oxygen, nitrogen, carbonic acid, neon, argon, crypton, etc., all of different critical points, offer a great resistance to liquefaction. Nitrogen's critical point being — 140 deg. C., air had to be brought below that temperature before it could be liquefied.

The process of using compressed air for mechanical purposes has always been surrounded heretofore with drawbacks of great importance, on account of the intense cold generated, which freezes the oils and stops pistons and valves. For lubricating purposes, petroleum ethers are now in use and the liquid gas is stored up in a cylinder enclosed in a vacuum.

Liquid gases have a great influence on electrical conductibility, which is increased at the ratio of the lowering of the temperature of the condensed gas. A circuit, plunged in liquid hydrogen, will have its conductibility increased one hundred fold. When the conduit of an electric lamp is plunged in a liquid gas, the light increases in proportion to the lowering of the temperature of the gas.

Solid gases will, in a very near future, supplant steam and electricity as motive power for steamships and railroads. The dangers of explosibility, which are inherent to liquid gases, can be eliminated in the solid forms.

Aerial navigation awaits with impatience that the finishing touches are put to a solid gas of a pneumatic pressure that will insure the conquest of the air.

PIERRE DE CORBIERE,
21 Park Place, New Rochelle, N. Y.

Feed Water Temperature and Steaming Capacity.

Philadelphia, July 13, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In reading the editorial discussion in your June 19 issue on "Steaming Capacity of Locomotives," it occurs that any formula expressing this factor should take note of the lowest feed water temperature. A locomotive having certain steaming capacity in cold climates, where the tender water temperature might often be as low as 35 deg., and the boiler pressure 200 lbs., would need a boiler with a grate area and heating surface to take care of 1,197 B. T. U.'s per pound of steam required by the cylinders. This same locomotive, if transferred to a tropical country where the minimum water temperature was 80 deg., would require only 1,152 B. T. U.'s, and the boiler could therefore evaporate 3.76 per cent. more steam than in the colder climate, without any increase in coal consumption. If the same locomotive were supplied with a means for heating its feed water to 212 deg. (not like the injector, which uses live steam), it would require but 1,022 B. T. U.'s per pound of steam. Its steaming capacity would therefore have been increased 14.6 per cent., minus, of course, the steam required by the pump in forcing the feed water into the boiler. If an ordinary direct-acting feed pump were used, the deduction on this account would not be more than 2½ per cent. The hotter water gives the same result as an increase in the size of the boiler.

THOS. C. M'BRIDE.

[In the editorial referred to it was said that but two methods are available for increasing the steaming capacity of a locomotive, namely: "increase the size or efficiency of the boiler or improve the efficiency of the cylinders . . ." The primary function of the feed water heater is to return to the boiler part of the heat otherwise wasted in the exhaust. By this the efficiency of the boiler and hence the steaming capacity is increased.—EDITOR.]

The C., N. O. & T. P. Code.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your comments (June 19, page 423) on the revised code of train rules adopted by the Cincinnati, New Orleans & Texas Pacific, you seem to consider the use of the third personal pronoun "they" in the rules under consideration objectionable, preferring the use of the implied but not expressed second personal pronoun with the imperative mood. The use of the second personal pronoun, either expressed or implied, presupposes the presence of the persons addressed *now* and *here*. A professor addressing his class; a minister addressing his congregation; an employer in his office addressing his associates or subordinates; a manager in his factory addressing his workmen; a general addressing his troops in the field on the eve of battle may appropriately use the second personal pronoun because the objects of his address are all present, now and here. "Thou" and "you" are the only pronouns which could then be used with propriety and effect. But when the commands enjoined; the exhortations addressed; the information conveyed are intended for men present neither in time or place, the third personal pronoun and not the second should be used. Indeed, in philosophical as well as grammatical propriety it is the only one admissible.

If confirmation of the views herein expressed were necessary reference might be made to the "Manual of Examinations of the United States Civil Service Commission"—a brief examination of the instructions therein contained would show that the third personal pronoun is used; the only exception being in section 24 when the persons undergoing examination are present, and are addressed personally as now and here by the Board of Examiners. In this section as a matter of course the only admissible pronoun is the second personal pronoun. Thus the exception proves the rule laid down above. Reference might also be made to the rules issued for the selection and appointment of officials connected with the Post-office Department.

You say: "The changes which have been made by Mr. Murphy seem to have been mainly in elimination and condensation. . . ." To this it may be replied that although elimination and condensation should never be made at the sacrifice of clearness of definition or cogency and vigor of expression, yet unnecessary repetition, useless tautologies, cumbrous and superfluous verbiage should all be eliminated and the paragraphs embodying them condensed. What is needed is a definite concept embodied in language clear, distinct, strong, unequivocal and elegant. In the present revision these ideas have been kept in view; namely, clearness first; adequacy of expression, second, and current classical English third.

The *Railroad Gazette* has reprinted a section of the Code "in order to enable the reader to make comparisons for himself," observing that "the code under review does, however, constitute a criticism on Mr. Hammond's work, as numerous changes are made in the language." The compiler did not intend by this revision to criticise the work of Mr. Hammond or of any other author or compiler of rules. His object was to prepare for the use of the officials and employees of the C., N. O. & T. P. Ry. a body of rules adequate to their needs—making use of existing codes as far as they were available for his purposes, eliminating, condensing, amplifying and enlarging as occasion required. The result is a code which has superseded all others hitherto in use by our road and is found to meet our requirements.

W. J. MURPHY.

Corrosion of Steel Cars.

New York, June 30, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

There have recently appeared several articles on The Depreciation of Steel Cars by Corrosion. Steel construction for cars is comparatively new in this country, but it has been satisfactorily used after some 50 years of experimenting in Europe. For a number of years before we began our experimenting, freight cars were being built of steel; and large quantities of coal have been handled in them since then.

I, personally, made a careful study in foreign countries, taking measurements and securing photographs of steel cars on special trips taken for that purpose some 14 years ago, and from the data collected at that time and the experience gained from the mistakes of others, noted by me, I designed, patented and built seven distinct classes of Goodwin cars.

Corrosion is one of the most serious problems to be considered in steel construction. In most of the recent articles on corrosion of steel cars, the arguments and deductions are apparently based on the experience resulting from the service of the hopper type of pressed steel cars in use during the last 4 or 5 years in the United States only.

Durability of freight cars appears to rest entirely on the method of construction, and the shape and weight of the material used, rather than on the kind of material. In designing a steel car it is necessary to take into consideration not only the added strains from the heavier load carried in the larger capacity steel car, but the corrosion of the steel from the action of sulphuric acids, especially where cars are to carry bituminous coal. In the hopper car the center sills running through the load render it difficult to protect the backbone of the car from the attack of these quick acting acids. The Goodwin car has been designed to avoid the ill effects of corrosion as far as possible by keeping the framework and structural portions of the car from any possible contact with the acids from the load. The two center sills and the general structure of the car are protected by the stationary aprons and floors in the carying box of the car, these protecting members being so arranged that all moisture drained through the load is shed clear of the car, carrying with it the acids.

To further protect the structure, all parts of the car are dipped in carburet black before being riveted into place, and all surfaces of sheet steel are heavily coated with the same material before being put together. This treatment prevents any moisture from entering the crevices where it otherwise would remain and start corrosion. Any pigment that is liable to check or crack from expansion or contraction of the metal, or that is destroyed with the heat of riveting in erecting, is unsuitable for protecting steel cars.

The experience of something over nine years in handling cars constructed under these designs and built entirely of metal, has demonstrated the fact that maintenance and repair charges in that period have amounted to less than 1 per cent., and in several Goodwin cars which have been in wrecks during this period where parts have been cut away in the shops for replacement, the two adjoining metal surfaces have been found adhering as if cemented by the carburet black, the pigment remaining with a certain amount of elasticity not found with other preparations which we have from time to time made tests of in service.

The threatened destruction of the market for the steel car is not as serious as it appears to be. On the contrary, the steel car has only just begun to demonstrate its value. To make the steel car a practical money earner only requires proper attention to the method of construction, sufficient weight in the material used, and a proper protection to prevent corrosion of the vital parts of the car.

JOHN M. GOODWIN.

Lake Shore-Rock Island Chicago Passenger Terminal Opened to Traffic.

The new passenger terminal of the Lake Shore & Michigan Southern and the Chicago, Rock Island & Pacific at Chicago was opened for traffic on Sunday, July 12. Though fronting on Van Buren street it is called the La Salle street station in order to avoid confusion with the Van Buren street station of the Illinois Central. A description of this new station from the architects' plans was published in the *Railroad Gazette* March 14, 1902. The plans were afterward modified to provide four additional stories, making the building 12 stories high, 10 of which are used for offices by the two roads owning the station.

The main building fronts 215 ft. on Van Buren street and extends back 157 ft. Between the main building and the train-shed is a covered concourse 46 ft. wide and 580 ft. long. The shed contains 11 tracks, which have been elevated 15 ft. above the street level. As seen by the engraving of the train-shed, the roof is supported by bow-string trusses with steel eye-bar bottom chords spanning the entire width. There are 19 of these trusses, the height to center of each being 60 ft. The roof is made of cement and expanded metal slabs, 2 ft. x 5 ft. x 2¾ in., covered with one layer each of felt and a composition roofing. The sides of the train-shed are brick, liberally provided with windows. The rooms for baggage and express occupy most of the space under the track floor. The elevators are seen in the engraving.

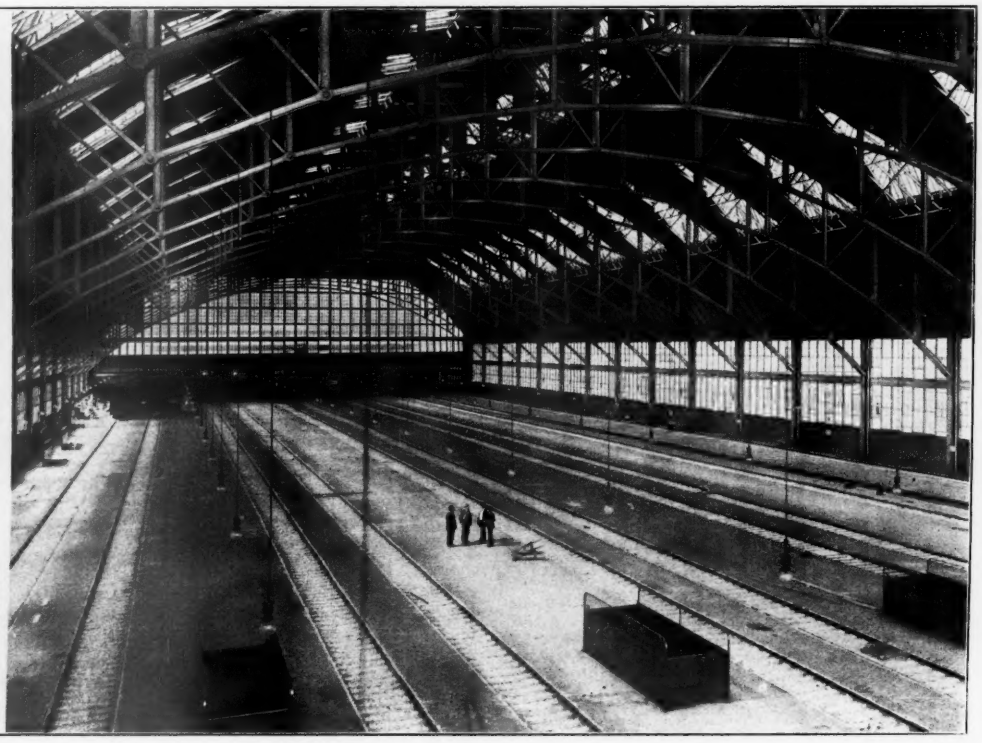
The main lobby, which is on the street level, is 96 ft. x 118 ft. and is entered through the main vestibule. It is finished in white enamel brick. The general ticket office, baggage checking room and the dining room are also on this floor. The second floor, on which is the main waiting room, is reached by a grand staircase and two elevators. The main waiting room is 106 ft. x 108 ft. The pillars and walls are white marble, the decorations of the latter being mosaic panels. The ceiling is plaster, finished in light cream color, and the floor is mosaic tiling.

The power station for the terminal is located under the elevated tracks across the Harrison street subway, one block south of Van Buren street, and opens on the subway. This station was briefly described in the *Railroad Gazette* Sept. 12, 1902. The generators furnish current for lighting, for running the elevators and for charging the storage batteries for switch operation in the interlocking plant. The main building contains 6,800 incandescent, and the train-shed 108 arc lights. The offices will be heated by the Webster vacuum system, while the two lower floors have a fan system designed for both heating and ventilating, the fan having a capacity of 62,000 cu. ft. per minute.

In addition to the two proprietary roads, the New York, Chicago & St. Louis also uses the station. There will be altogether 94 trains in and 88 trains out of the station in 24 hours, which includes all suburban trains of both the Lake Shore and Rock Island. All of the tracks are equipped with Boynton station indicators, similar to the pattern installed in the Grand Central Station, New York, which was described in the *Railroad Gazette*, Oct. 10, 1902.

The signals and switches are the Taylor all-electric, a description of which, with a diagram of the yard, was given in these columns March 13 last. The terminal has capacity for 1,500 train movements a day.

Main Building.



Train Shed; Looking North Toward Main Building.

Main Waiting Room.

Main Lobby on Ground Floor.

Terminal Passenger Station of the Lake Shore & Michigan Southern and the Chicago, Rock Island & Pacific Railways, La Salle Street, Chicago.

The John Fritz Medal.

The John Fritz Medal Fund Corporation, incorporated May 18, 1903, has published a small pamphlet giving the history of the organization and the by-laws of the corporation which will be continued in perpetuity to award the John Fritz Medal. In it are also given the rules of award as adopted which are as follows.

1. The John Fritz Medal was established by the professional associates and friends of John Fritz, of Bethlehem, Pennsylvania, U. S. A., on Aug. 21, 1902, his 80th birthday, to perpetuate the memory of his achievements in industrial progress.

2. The medal shall be awarded for notable scientific or industrial achievement. There shall be no restriction on account of nationality or sex.

3. The medal shall be of gold (of —— ounces weight and —— fineness) and shall be accompanied by an engraved certificate, which shall recite the origin of the medal, and the specific achievement for which the award is made. Such certificate shall be signed by the Chairman and Secretary of the Board of Award.

4. The medal may be awarded annually, but not oftener.

5. No award of the medal shall be made to any one whose eligibility to the distinction has not been under consideration by the Board of Award for at least one year.

6. Awards shall be made by a board of 16, appointed or chosen, in equal numbers from the membership of the four national societies: The American Society of Civil Engineers, The American Institute of Mining Engineers, The American Society of Mechanical Engineers, and The American Institute of Electrical Engineers. The governing bodies of each of those societies shall be requested to appoint from its membership one representative who shall hold office for one year, one for two years, one for three years, and one for four years; and each succeeding year to appoint one member to serve for four years.

7. In case of failure of any of the national societies to make the original appointments as requested, the selection of representatives from its membership shall be made by those appointed from the other societies, and should any future vacancy occur by reason of the failure of any of the said societies to act, or otherwise, such vacancy shall be filled by the Board of Award, from the membership of the society so failing.

8. Should one or more of the four national societies go out of existence its representation on the Board shall

cease and terminate and future awards shall be made by the representatives of the remaining societies.

9. The vote of the Board of Award shall be by letter-ballot, which shall be canvassed not less than 30 days subsequent to its issue and the affirmative vote of at least three-fourths of the Board of Award shall be necessary for an award.

The by-laws state that on or before July 15 of each year the Secretary shall send to each member of the Board of Award a blank form on which to propose the names of candidates for the medal. This is to be returned before October 15 following, and on November 15 the Secretary must send out to each member of the board a list of all such names proposed. At the annual meeting in January following, one name is to be selected from this list as a candidate for the award for the next year, and a majority vote of the members present shall be necessary for such selection. On the following 15th of November a letter ballot is to be taken and the candidate at that time must receive a three-fourths vote of all the members of the Board of Award. In case the candidate is rejected there shall be no award for that year.

The certificate which is to be furnished with the medal to the successful candidate, will, in addition to the signatures of the Chairman and Secretary, have engrossed upon it the names of the entire "Board of Award," so as to indicate the representative National character of the award.

McBride's Locomotive Feed Water Heater.

Some of the advantages of the feed water heating system shown herewith are:

1. An increase of steaming capacity of 10 to 15 per cent.

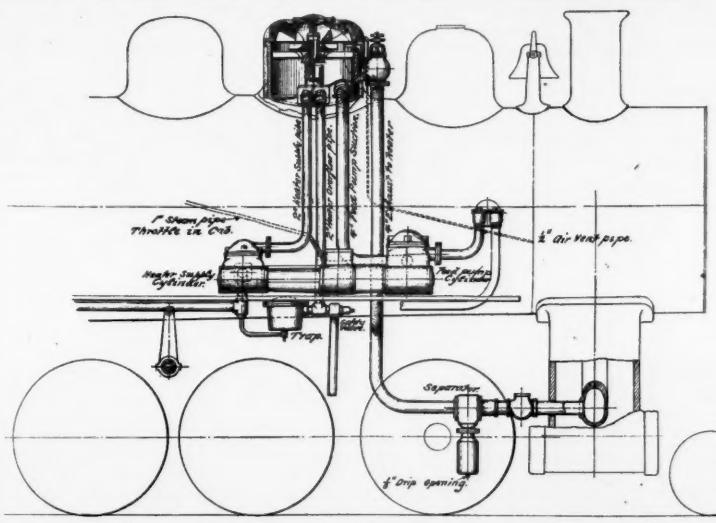
2. A fuel saving of 12 to 25 per cent., depending on the tender temperature (the lower the greater the saving) and the rate of evaporation.

3. A saving of 10 to 15 per cent. of the water used, in addition to the saving of the heat and water usually wasted in starting injectors.

4. A convenient means of increasing the capacity of old locomotives.

5. Dryer steam and less variation of water level.

A feed pump is necessary for any efficient feed water heating system. An injector takes about five times as much steam as a feed pump to do the same work, and while the injector does not lose or waste any heat in that all the heat of the steam it uses is sent directly back to the boiler, it heats the water passing through it to such an extent that there is little or no opportunity to heat it further.



McBride's Locomotive Feed Water Heater.

In the proposed system the heater is placed on top of the locomotive boiler and in exterior appearance matches the dome and sand box. The feed pump is the standard horizontal type placed on or just under the running board, where it will have an ample head of water on its suction valves to ensure positive and quiet action. It is well lagged and covered to reduce radiation losses and prevent freezing in cold weather. Water is positively supplied to the heater by a water cylinder of about the same size as the feed pump water cylinder attached in tandem to the feed pump and therefore operating in unison with it and always supplying the heater with about as much water as the feed pump is taking out of it. The heater water level is preserved by an overflow pipe in the center of the heater and through which the excess water is returned to the tender pipe to be again pumped to the heater—a special trap being provided to prevent the passage of exhaust steam down the overflow pipe. The oil is removed from the exhaust steam on its way to the heater by a separator, and where the water is very bad a filter may be provided between the heater and the feed pump.

To determine the saving in fuel resulting from the installation of a feed pump and feed water heater on a locomotive we should credit the heater with the heat recovered from the exhaust and returned to the boiler and charge against it the steam used by its feed pump, the difference representing the net heat recovered by the heater. From this figure, knowing the increased evaporative power of the coal at the lesser rate of combustion required, it is possible to figure the saving of fuel.

The steam used by the feed pump may be very closely estimated by assuming a steam consumption of 100 lbs. per h.p. per hour. Each pound of water fed into the boiler against say 200 lbs. pressure will require $200 \times 2.31 = 462$ ft. lbs. Each pound of steam used in the pump will give $\frac{33{,}000 \times 60}{100} = 19{,}800$ ft. lbs., and will therefore pump into the boiler $\frac{19{,}800}{462} = 42.8$ lbs. of water. The heat from this pound of steam will therefore help heat the water pumped by it $\frac{966}{42.8} = 23$ deg.

With a boiler pressure of 200 lbs. and a tender water temperature of 70 deg. the heat required to generate one pound of steam will be $1{,}200 + 32 - 70 = 1{,}162$ heat units—therefore every 11.6 deg. the feed water can be heated above the point to which it might be heated by the pump exhaust represents 1 per cent. recovery of heat. Assuming an exhaust steam pressure of 15 lbs. (250 deg.) in the heater the water temperature should be at least 242 deg. and the saving therefore

$$\frac{242 - (70 + 23)}{11.6} = 12.8 \text{ per cent.}$$

In winter the tender temperature may be 40 deg. and with the same heater pressure as above the heat saving would be

$$\frac{242 - (40 + 23)}{1{,}200 + 32 - 40} = \frac{179}{1{,}192} = 15 \text{ per cent.}$$

This recovered heat might be considered as made use of in either of two ways:

1. To increase the steaming capacity of the locomotive without burning additional fuel.

2. To economize fuel.

The first effect may be best understood by supposing the 10 to 15 per cent. heat recovered to be represented by an additional weight of steam generated in the boiler on account of the hotter feed water without calling for the burning of any additional coal. This additional weight passes with the other steam through the cylinders generating its proportionate increase in power and on to the exhaust passage where it leaves the other steam and returns through the heater to the boiler. The original weight of exhaust steam passes to the exhaust nozzles and there is therefore no change in the draft.

To estimate the fuel saving due to the above recovery of heat reference is made to a curve presented by Mr. Vauclain, of the Baldwin Locomotive Works, before the St. Louis Railway Club Nov. 11, 1898. This curve shows the "Effect of Varying Rates of Combustion" of coal per sq. ft. of grate surface expressed in water evaporated per pound of coal reduced to "from and at 212 deg." If the locomotive to which this curve applies burned 100 lbs. of coal per sq. ft. of grate surface, and the rate of evaporation water was 6.55 lbs. per pound of coal, then about 655 lbs. of water was evaporated per sq. ft. of grate. A reduction of 10 per cent. in this amount due to hot feed water would result in an evaporation of 655 — 65 = 590 lbs. of water from and at 212 deg. per sq. ft. of grate. Referring to the curve we find that this locomotive would need to burn but 86 lbs. per sq. ft. of grate at which point in the curve the evaporation would be 6.85 lbs. of water from and at 212 deg. per pound of coal. The fuel saving due to the heater would therefore be $\frac{100 - 86}{100} = 14$ per cent.

Applying the same method to this locomotive under conditions ordinarily requiring 130 lbs. of coal per sq. ft. of grate and an evaporation of 5.95 to 1, and assuming that the heater reduces this amount by 10 per cent., or from $130 \times 5.95 = 773.5$ to $773.5 - 77.3 = 696.2$ lbs. equivalent evaporation per sq. ft. of grate, we find from the curve that this condition would have existed when this locomotive was burning 110 lbs. per sq. ft. of grate, at which rate its evaporation would have been about 6.35 to 1. The saving of fuel is therefore $\frac{130 - 110}{130} = 15.4$ per cent.

Under other conditions the saving in coal may be as much as 27 per cent. There is no doubt but that the precipitation of the scale forming matters in the heater and the recovery and return to the boiler of 10 to 15 per cent. of pure water, will keep boilers in a cleaner condition than if fed by an injector. In addition to this, the hotter feed water and lessened necessity for forcing the fire should have an effect on the life of the tubes, and decrease the cost of maintenance. The boiler fed with a feed pump should give dryer steam than the injector fed boiler for the reason that the former need supply but 2.4 per cent. steam to feed itself in addition to that used in the locomotive cylinders, whereas the injector needs an excess of 12 per cent. to 17 per cent.

It has already been shown that the percentage of coal saved will always be greater than the percentage of steam taken from the cylinder saddles and returned to the boiler. The reduction in the draft due to the lessened amount of exhaust steam passing to the exhaust nozzles would therefore always occur at a lesser rate than the reduction in necessary coal consumption, and no change whatever in the exhaust nozzles would likely be required. In the first case cited above with a heat recovery of 10 per cent. and a fuel saving of 14 per cent. there would be left 90 per cent. of the exhaust for the draft with only 86 per cent. of the coal to burn and therefore proportionately more draft than before the heater was used.

It would probably not be advisable to change the usual injector arrangement in applying a feed pump and heater to a locomotive for the reason that it might be desired at times to feed with the injectors when standing in stations or drifting. A feed pump does not use enough steam to heat the water pumped by it to any considerable extent, and, because the water fed to the boiler would then be cold, it might not therefore be advisable to use the pump except when the heater was receiving exhaust steam from the cylinders.

The average cost of maintenance of a locomotive boiler is about $350 per annum, and this cost is proportional to the amount of scale forming material entering the boiler, the amount of coal burned and the forcing of the fire. The first item would be reduced at least 10 per cent. on account of the pure water recovered from the exhaust and possibly as much again on account of the material precipitated in the heater. We might with this reasoning entirely neglect the other two items and expect a reduction in boiler maintenance of at least 20 per cent. or say $70; certainly more than enough to cover the pump and heater maintenance, particularly where large numbers of feed pumps and heaters might be in use.

The first essential for any locomotive feed water heating system is reliability. Very few trains are stalled due to failure of air-brake compressors and their governing apparatus. These are but a type of pump and we should expect to have equally reliable results from well designed feed pump and heating system.

The proposed system furthermore involves little that is not found in every day use in marine and stationary work.

The device is the invention of Mr. T. C. McBride, of the Worthington Pumping Engine Company, Philadelphia.

Notes on Discipline.

BY A. J. LOVE.

Late Assistant Superintendent, Alabama Great Southern.

The disasters called accidents, which are directly attributable to faults in the train service force, are large and serious enough to warrant an analysis of the cause, and an endeavor to discover a remedy. The assumption that a chosen few are endowed by the Creator with the capacity for managing and training men has had much to do with past failures. It needs no special endowment to discipline a railroad force. Discipline is as exact a science as chemistry, and to produce correct results its study and application must be as laborious and faithful. These specially endowed men do not exist. Physical deformities and the well-known marks of dissipation can as readily be seen by one man as another, but that mental excellence which develops a skilful trainman can only be known by actual trial.

A train service force of the highest efficiency can be obtained only by the most careful selection of men and the most thorough discipline. The only fact positively known is that the young can be trained easiest.

To get a thorough knowledge of the essential qualities of men there must be a study of man; his physical and mental powers. Not only what can he do but what will he do. Are his powers constant or variable? If variable, why? Can the cause be discovered? There is much literature on the subject which can be profitably studied, showing how a man is influenced by heredity, education and environment. Practical experience and close observation will demonstrate how far men can be moulded by discipline. Few men are incapable of high training. The training which makes a skilful trainman does not differ in principle from the training of a good mechanic. Continued work under strict and intelligent supervision will accomplish all that is possible. This requires close application on the part of the disciplinarian. The requirement of the highest excellence and complete obedience must never be relaxed. It is a slow, tedious and laborious process, but there is no other. A force of trainmen can be ruined in a month. It takes years to build up a good one.

The constant repetition of an action at first directed by the will, so develops the connection between the perceptive and motor nerves that the action will be made without any effort of the will, leaving no definite impression on the memory, and often no impression whatever. When, in the handicrafts, these movements are accurate, the artisan has attained the highest possible skill. Telegraphers and stenographers are the same. Telegraphers will send and receive messages and not remember the contents. The idea that a man used good or bad judgment in an emergency is usually erroneous. If judgment is reasoning based on knowledge, there was none. There was an impression and an action; the action influenced by previous habit and nothing more. Locke says that no man can reason except in a language with which he is familiar. Ordinarily in an emergency the language could not be framed before the action is necessary. There was no reasoning and no judgment, good or bad. If this be

true, it demonstrates the necessity of constant supervision and training. If the disaster is caused by a bad habit, the disciplinarian must bear his share of the blame.

The skilful man, other things being equal, will have more endurance than the unskilful. The constant exercise of the will is impossible for any extended time. This can be demonstrated by observing men at work on any intricate and distasteful problem, where the exercise of the will is constantly necessary. The tendency to look out of the window is very great and finally uncontrollable. Trainmen are on duty many hours and often the last move must be as precise as the first. The train rolls into the terminal and makes the stop at the precise spot. Is this reasoning? No, it is skill. No human being could make the necessary calculation in the time that this is done.

It is sometimes said that men are perverse; that they are wilfully so. Such cases are rare. The few men of this kind that are found in the service should be got rid of; they are unfit for train service. It is usually a constitutional defect and beyond any human power to overcome.

The effectiveness of a train force depends on the disciplinarian. There is no royal way to perfect a train force. It is hard and unremitting labor that tells. The most complete signal equipment is of no value without good discipline. The discipline must be a kind that trains, not only punishes. The rules must be habitually enforced. There must not be one set in the book and another in the practice. If the men are well trained, it requires no effort of the will to obey, but it does require an effort to disobey. When a man lives in a certain place any length of time, it requires no effort to find the way home. No reasoning, no thought is required. But let him have some errand that takes him a little out of the route, if he is at all preoccupied his side errand is forgotten, and often he either goes home, in complete forgetfulness of it, or remembers it after he has passed the turning point and is compelled to retrace his steps. This has many parallels in railroad work. Force of habit does a large share of the daily acts.

When thorough obedience of the rules has been developed into force of habit, the highest results will be attained, and disasters reduced to a minimum. Is this the case on the railroad? Does the flagman immediately go back with danger signals when the train stops at an unusual point, or does he loiter near the rear in the hope that he will not have to go back at all? Are the locomotive whistle, the hand and lamp signals, accurately given? Slovenliness in these indicates the mental habit which pervades the whole of the man's work.

Butting collisions on single track come from another cause. The defect is in the system; and as long as successful operation depends on the memory alone, they will happen. Men with perfect memories do not exist. The only remedy is to abandon the system and take another.

The nearest approach to a perfectly safe system for single track is the train staff. In this memory is entirely eliminated, but it is still physically possible to have a collision. The engineman may be asleep; or for some other reason, disregard the signal, but as long as he obeys the signal, it is safe. With close supervision, automatic signals are good. The only difference is in the check. With the staff system, non-observance would probably not develop into a habit. With the automatic it may. In one case any failure to observe rules would be reported, while in the other it would not.

That there is fluctuation of the mental powers of men there can be no doubt. Men can follow their ordinary occupation, under pressure, 24 or even 48 hours, but it is a question whether they are wholly awake all the time. To all appearances they are, but there is all the time the likelihood that anything outside of the regular routine will pass unnoticed. Part of the brain is undoubtedly at rest and if called into action responds with the sluggishness of a drowsy man.

Investigations of accidents are often unsatisfactory, because the evidence given by the trainmen is more often from reasoning and deduction after the accident than from any impression made at the time. There is usually no intention to deceive in this. They are not even aware that they have reasoned out their assertions. In one case an engineman was told bluntly that he had lied about a collision. His reply was "I guess I did." There had been no wilful lie at all. The movements previous to and up to the moment of the crash had made no mental impression, and his reasoning and deductions were erroneous.

If discipline is taken as a science, instead of a special gift, and the combined efforts of those interested are employed to study and develop it, disasters would be reduced greatly. Men must be taken as they are, not as we would like to have them. We cannot have men made to order. The ready-made article is all there is in the market. But it is somewhat plastic and can be moulded into something near the desired shape.

There is a fallacy that one railroad has good men and another bad. Men average very much alike. A good disciplinarian will have good men. There is no room for charity in the practice of the disciplinarian. He must be inexorably just. When it is evident that a man is incapable of training he must be dispensed with. Charity, exercised to retain an incompetent man in the service, is little less than a crime; a crime which has resulted in many fatal accidents.

Promotions must be fair and be recognized by the men to be fair. If a brakeman or fireman is unfit for promotion in his regular order there is a reason for it; as apparent to his fellow workmen as to his superiors. Despondency saps the energy more than work and a "passed" man soon loses hope and ambition. An unjust punishment will have the same result. Train the men up in the way they should go and they will not depart from it even when out of your sight.

Special Car for Heavy Castings.

The accompanying drawings show details of the heavy 150-ton car built by the Bethlehem Steel Company, a description of which was given in the *Railroad Gazette* July 10. The drawings are self-explanatory.

High Speed Electric Railroad Problems.*

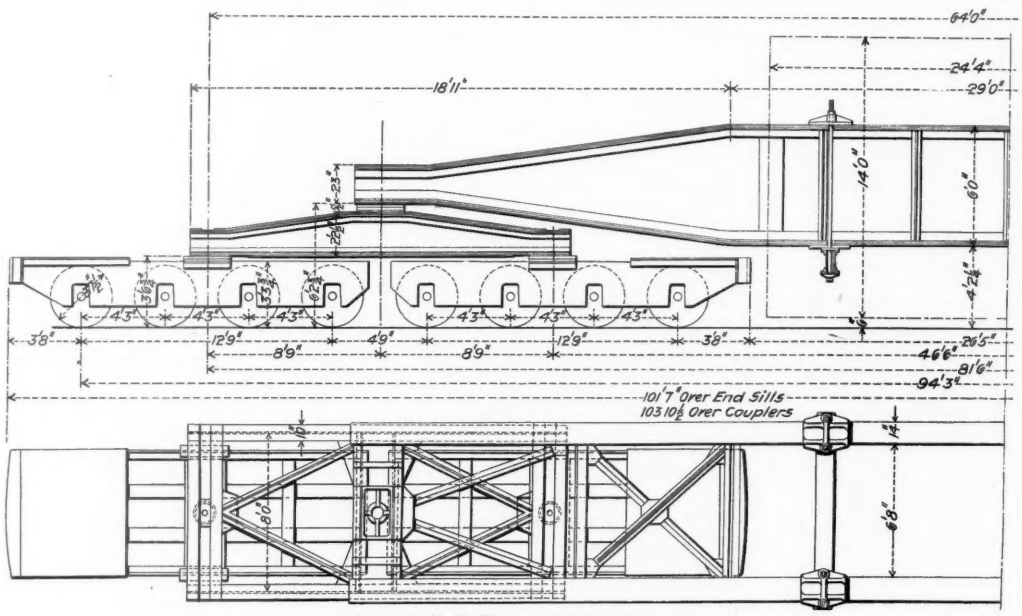
It is the purpose of this paper to touch briefly upon some of the fundamental relations existing between the first cost of a railroad and its probable cost of operation and schedule speed, discussing also the probable traffic receipts with different methods of operation. Most of the data presented is obtained from a very elaborate series of tests. . . .

Owing to city running at slow speed, suburban roads must make as good time as possible on the suburban route. . . . In fact, such roads, when paralleling steam lines operating on private right of way through the city . . . . are compelled to face very serious engineering and economic problems due to the great amount of generating apparatus, line copper and motive power. . . . Frequent service will always be a valuable asset and one that cannot be duplicated with the steam locomotive, except at higher cost of operation, but if it takes considerably longer to reach the city by means of the electric line than by the steam road with its better facilities for high speed, the electric line will fail to obtain the proportion of suburban business to which it has been accustomed in its more limited scope. . . . In considering the proper speed at which to operate a new electric line, it is necessary therefore to go very carefully into local details and especially canvass the competition with existing steam lines not only when operated in their present form, but also consider the possibility of their adopting electricity as a motive power. . . .

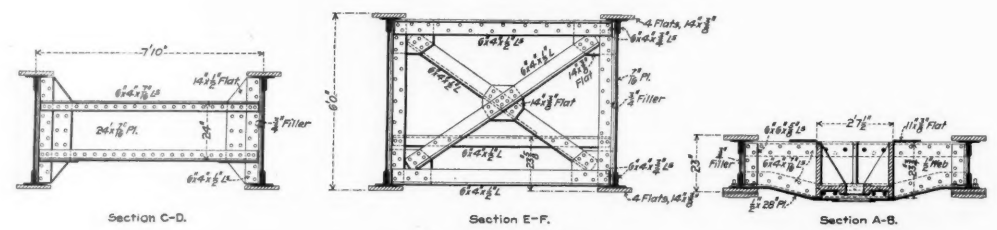
Much of the data on train resistance has been obtained with trains hauled by steam locomotives. Many of these tests neglected the wind-friction of the locomotive. Results from indicator diagrams are open to the objection that the steam locomotive is not square ended like a car and the wind-friction will not be the same as that of a train without a locomotive. . . . The only attempt known to the writer to obtain friction values with different number of cars was made by Mr. W. J. Davis, Jr., through the courtesy of the International Railway Company on the Buffalo & Lockport in March, 1900. Using these tests as a basis, the writer has drawn up three friction curves in Fig. 1, designating them A, B and C.

The C curve applies to single cars weighing about 40 tons. The B curve applies to the operation of two such cars in a train and the A curve to a train of such cars, say eight or more in a train. . . . As the results obtained by using them are not dependent upon their numerical values, intermediate points being easily interpolated, it is not of prime importance that the three friction-curves given represent accurately the conditions as set forth. In fact, with the different shaped cars now in use and the different cross-section of cars having the same weight,

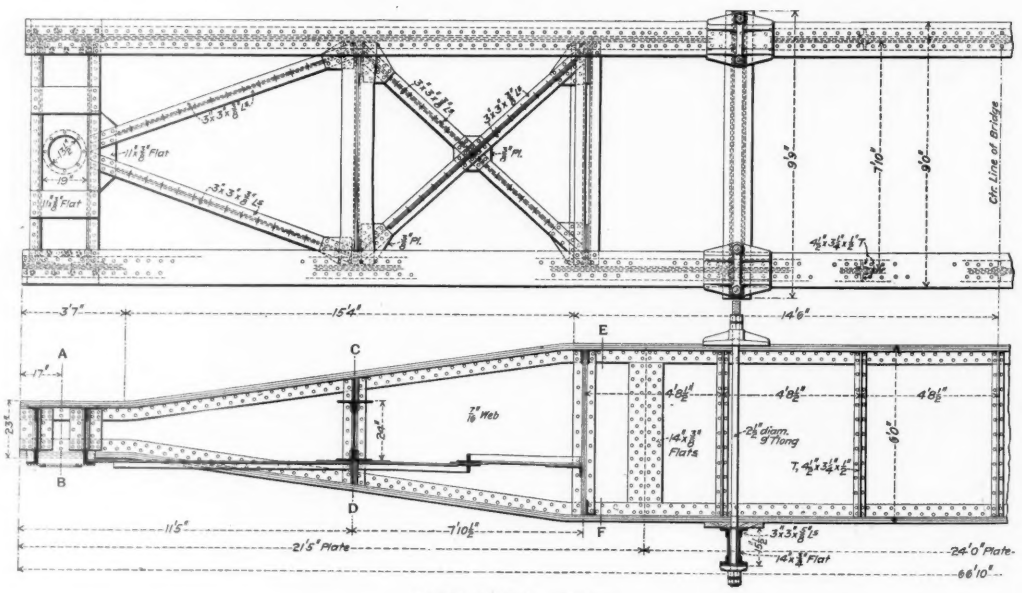
*Abstract of a paper by Mr. A. H. Armstrong, presented to the American Institute of Electrical Engineers June, 1903.



General Half Plan and Elevation.



Transverse Sections.



Detail of Main Girders.

Car for Carrying Heavy Castings—Built by the Bethlehem Steel Company.

etc., it is hardly possible to make one friction-curve which would apply accurately to all cases. It is probable, however, that the curves given have the general shape and the numerical values applying to average conditions. The friction-curves have been extended to maximum speeds approaching 90 m.p.h. in order that questions of motor capacity, train energy, possible schedule speeds, etc., can be followed up to maximum speeds equal to or better than those on steam roads. . . .

With the friction curves in Fig. 1 as a basis, the curves in Figs. 2, 3 and 4 have been calculated, showing the possible schedule speeds and energy consumption required up to and including 75 m.p.h. . . . The rate of acceleration and rate of braking do not have a marked effect on the energy consumption or possible schedule speeds for high-speed roads. The shape of the motor characteristic is not a determining factor and can be neglected without introducing a possible error of more than a few per cent. The controlling factor in all of these curves is the friction-curve, which includes track, rolling, journal and wind-friction.

The constants assumed in calculating the above curves are those pertaining to average high-speed suburban work as follows:

Gross accelerating rate.....120 lbs. per ton
Braking effort (average).....120 " " "
Duration of stop.....15 seconds each.

Track assumed to be perfectly straight and level.

In the above curves, due consideration is given to all the losses occurring during acceleration with the standard series-parallel controller and direct current motors. If the curves are to be used for alternating current motors, allowance must be made for the difference in accelerating efficiency of the two types of motors and their methods of control. The inertia of the rotating parts generally amounts to 5 per cent. and this value is taken throughout, being perhaps a little high for the higher speeds and low for the lower speeds. The speed-curve of a standard 125 h.p. motor is used throughout. The energy curves given are somewhat affected by the amount of coasting, intervals. . . . As the maximum speed of the service is reduced the difference in energy consumption between single cars and trains of cars is also reduced and at 30 m.p.h. a single car will require but slightly more energy per ton than a train operated at the frequent stops characteristic of low speed service. . . .

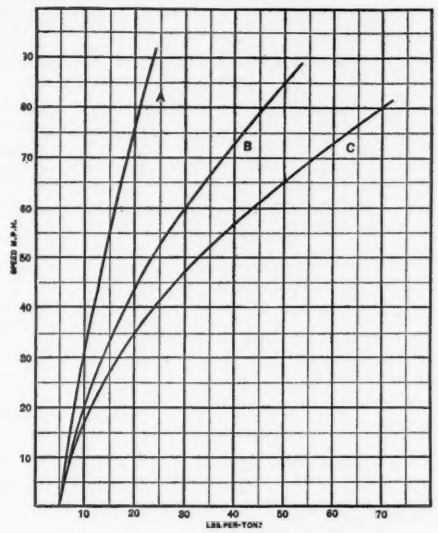


Fig. 1.—Train Resistance Diagram.

With one stop in 8 miles it is possible to make a schedule of 61 m.p.h. with a maximum speed of 75 m.p.h., and a schedule of 28 m.p.h. with a maximum speed of 30 m.p.h. If stops be increased so that they average one per mile, the schedule speed possible with a maximum speed of 75 m.p.h. drops to 29 m.p.h., while the 30 m.p.h. maximum speed permits a schedule speed of 22 m.p.h. Thus while 30 miles is but 40 per cent. of the higher

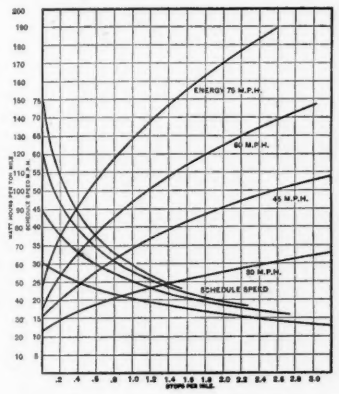


Fig. 2. (From Curve A.)

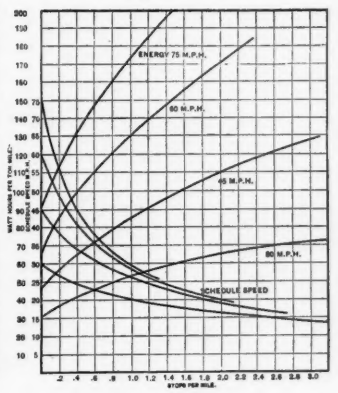


Fig. 3. (From Curve B.)

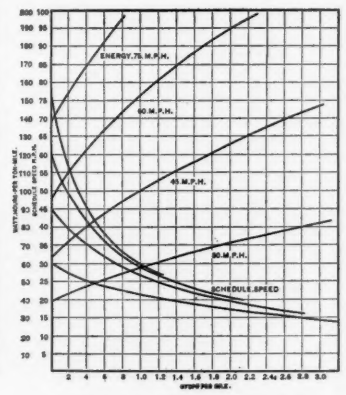


Fig. 4. (From Curve C.)

Speed and Energy Diagrams.

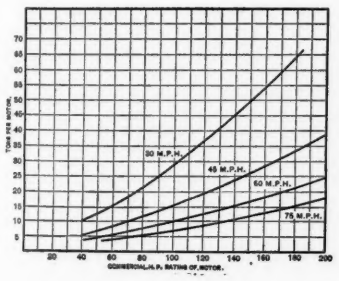


Fig. 5. (From Curve A.)

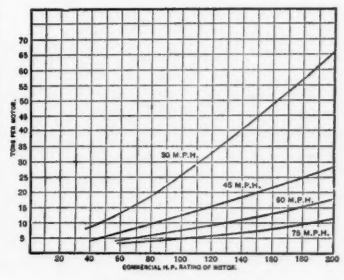


Fig. 6. (From Curve B.)

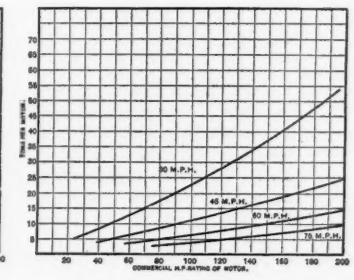


Fig. 7. (From Curve C.)

Motor Capacity Diagrams for 60 Degrees Rise.

although this is not as important in high speed work as in slow speed rapid transit accelerating problems. In order that the energy curves should be conservative, they are plotted with only 10 seconds of coasting permitted and therefore the schedule speeds given are nearly the maximum possible, and the energy curves given are practically the maximum possible with the maximum speeds assumed. . . .

An inspection of these three sets of curves shows the effect of wind-friction on trains of one or two cars running at high speed. The operation of single car trains is impracticable with light 40-ton cars of standard construction at 75 m.p.h. For example, it requires 47 watt-hours per ton-mile for a train of several cars, as against 137 watt-hours per ton-mile for a single car—both operating at 75 m.p.h. without stops. A single car uses 3.7. times the energy per ton that would be required for the operation of a train of cars. Even a two-car train will require but 92 watt-hours per ton-mile, or only 67 per cent. of the energy required per ton for a single car. A comparison at one stop in 4 miles would be nearer the actual results in practice in which a single car required 157 watt-hours per ton-mile, a two-car train requires 120 and a train of several cars 84 watt-hours per ton-mile. The results would indicate that in a class of service calling for very high maximum speeds, the tendency of electric roads will be to follow steam railroad practice and operate trains of several cars at more infrequent intervals rather than follow present practice of suburban electric roads and run single cars at frequent maximum speed it permits a schedule at one stop per mile of 76 per cent. of that possible with 75 m.p.h. maximum speed. The fallacy of using high-speed equipment for service requiring frequent stops is forcibly brought out by referring to the energy curves in Figs. 2, 3 and 4. With one stop per mile (Fig. 4) it requires 200 watt-hours per ton-mile with 75 mile maximum speed equipment. The 30 mlie maximum speed equipment can obtain 76 per cent. of the same schedule with an expenditure of only 28.5 per cent. of the energy. The two values taken for the maximum speed are the extreme, but serve the purpose of bringing out the tremendous price paid for high schedule speeds at frequent stops. The conditions of acceleration and braking are the same in both these equipments, while if higher schedule speeds were required with, say, one stop per mile, a higher rate of acceleration and, if practical, a higher rate of braking would be adopted. The difference in energy would be considerably reduced thereby, but neither the average rate of acceleration nor the braking could be very largely increased without incurring the possibility of discomfort to passengers. . . .

The method of determining the capacity of the motor is to make a series of temperature runs and note the rise in temperature per watt loss in different parts of the motor for different ratio of losses for armature and field. It is obvious that so long as the motor losses and their distribution are the same, the temperature rise of the different parts of the motor will also be practically the same. This assumes that the car will travel at the same average speed, which is not necessarily the case. . . . A close result can be obtained for practical purposes by obtaining the experimental thermal capacity curves at moderate average speeds upon an experimental track, and assuming that the conditions of ventilation so obtained will hold true for all the schedule speeds. . . .

The curves in Fig. 6 are the result of a large number of experiments and calculations on motors of similar design giving the relation between the commercial one hour rating of the motor and the number of tons which that motor will carry at maximum speeds of 30, 45, 60 and 75 m.p.h. The curves of 30 and 45 m.p.h. are probably accurate, those at 60 m.p.h. may be open to the criticism of being conservative, and at 75 m.p.h. with the superior ventilation afforded by the schedule speeds incident to such high maximum speeds, the motor capacity curves perhaps indicate too low a ton weight for 60 deg. rise. As no electric road as yet affords means of obtaining experimental values at this high maximum speed, the degree of error cannot be determined and in any case should not exceed more than a possible maximum of 15 per cent. Figs. 7 and 8 are plotted for 60 deg. also, but using friction curves B and C, so that by means of Figs. 6, 7 and 8 it is possible to determine the capacity of motor required for any maximum speed and any weight of train; while from Figs. 2, 3 and 4, the possible schedule speed and energy consumption can be obtained for any maximum speed and frequency of stops. The maximum speeds of 30, 45, 60 and 75 m.p.h. have been chosen as covering the present field of electric railroading, and intermediate values may be readily interpolated.

The relation between the commercial one-hour rating of a railroad motor and its service capacity-performance is very difficult to express. In fact, it is almost impossible to compare two motors differing essentially in their mechanical design, as the stand-test of a motor has no direct bearing on its service performance with its different distribution of losses and better facilities for ventilation. It is necessary therefore to obtain by experiment the performance of each individual motor under conditions approximating service operation, and determine the relation of stand-test to service operation for the particular motor in question. By carrying on a series of exhaustive tests on each individual motor it becomes possible to plot the results of such tests in curve form and show the relation between stand tests and service capacity, provided motors are of the same general design. Having obtained the capacity in tons per motor for different maximum speed equipments, the results were all found to follow general law; that is, the temperature-rise is practically constant over a wide range. With this simplification it becomes possible to compile curves 6, 7 and 8, giving the capacity motor required for any train weight, schedule and frequency of stops, the motors all being of similar design. These curves are all plotted with motors of the closed type, it being assumed that in miscellaneous operation advantage cannot be taken of opening ventilators. Where motors can be operated partially or fully open, the capacity, especially at high speeds, will be considerably increased. It is probable, however, that motors operating at speeds approaching 60 to 70 m.p.h. will be upon a surface track where it would be advisable to protect the motor from dust and moisture, and thus operate closed.

The results brought out by curves, 6, 7 and 8 show the probable trend of high speed electric railroading where trains of one or more cars are used. For example (Fig. 6) a 40-ton car with four motors, or 10 tons per motor, will require a 133 h.p. motor for 60 deg. rise when operating a train of several cars at 75 m.p.h. maximum speed, while the same weight of car would require a motor of at least 230 h.p. if operated as a single car with the same temperature rise and similar design of motor. That is, the motive power is doubled in going from train to single car service. Thus not only is train friction the determining feature of energy values, but it is the controlling feature as well of the motor capacity required to perform a given high speed service.

As pointed out in the earlier part of this paper it is not necessary that the friction curves A, B and C shall in themselves correctly give the numerical values for train, single-car and two-car work. The general shape of the curves is undoubtedly that pertaining to their respective size of train, and as the three curves are taken and subsequent calculations are all made upon a three curve friction basis, it is relatively an easy matter to interpolate and obtain the energy, schedule speed and motor capacity required for any train-friction expressed in pounds per ton. . . .

Having obtained the data upon which to base calculations for the proposed electric road, perhaps the best method of showing its application would be to take a concrete case. Let the distance from A to B be, say, 100 miles, or great enough to get over the consideration of location of substations in relation to the length of the line. Assume also that the proposed road will parallel a steam line, or that there are other reasons necessitating a high schedule speed, and that stops of 15 seconds duration will occur every four miles and that the motors will be direct current supplied from substations fed from a single central generating station. It is desired to know the effect that single car or train operation will have upon first cost and cost of operation.

It is assumed that the competing steam road will have a schedule speed in the vicinity of 40 m.p.h. Such express trains as exceed this schedule will offer such very infrequent service, and will furthermore be so restricted to their through travel that they will not enter as a factor for consideration. By referring to Fig. 4 we find that a schedule speed of 40 m.p.h. can be obtained with

a maximum speed of approximately 48 m.p.h. with one stop in four miles. The energy consumption will be 82 watt-hours per ton-mile and the motor capacity will consist of four 110 h.p. motors operating a single 40-ton car with a temperature rise of 60 deg. (Fig. 8). The energy consumed at the car will therefore be 131 k.w. or 144 k.w. at the substation busbar, allowing an average drop of 10 per cent. in the third rail. With a substation busbar potential at 600 volts, each car will average 240 amperes.

Assuming that the road will be double track with 80 lb. track rails and 100 lb. third rail, the distance apart of the substations will be approximately 13 miles with a maximum drop of 170 volts when two cars are passing midway between substations, one of which is accelerating. This drop is permissible as it is momentary only. Each substation must be able to accelerate one car and supply another at full speed, or must give 850 amperes momentary output and a sustained output of 500 amperes. The substation will therefore be called upon to deliver momentarily 510 k.w. and should contain not less than one 300 k.w. rotary converter and preferably two, one being a reserve. This size of converter is based upon the assumption that cars run always as single units and not in trains, and that converters can stand a momentary over-load of 100 per cent. With half-hour service cars will be spaced 20 miles apart, so that there will be required a generator capacity of two cars every 20 miles (double track) or 340 k.w. assuming 15 per cent. loss in rotary converter substations and transmission line. The generating station capacity per mile of track will therefore be 17 k.w., and the substation 46 k.w. with reserve, and 23 k.w. with no reserve. Taking the cost of generating station in round numbers at $100 per k.w. and substation at $35, the cost of a 40-ton car complete with four 110 h.p. motors, controllers, etc., at $9,000, we arrive at the following approximate cost:

Approximate First Cost Per Mile, Single Car Train.	
Generating station	$1,700
Substations with reserve	1,610
Equipment (plus 20 per cent. reserve)	1,120
Total	$4,430

The above total of $4,430 represents the approximate first cost of the various items noted when operating a single 40-ton car every half-hour at 40 m.p.h. schedule speed and stopping 15 seconds once in four miles. Following through the same process with two 40-ton cars operating on one hour headway at 40 m.p.h. schedule with the same track and third rail construction, we arrive at the following conclusions:

Watt hours per ton mile.....63
Train energy at train (80 tons) .202 k.w.
Distance apart substations.....9.1 miles
Size of substation.....two 400 k.w. units.

Each train consisting of two 40-ton cars will consume 224 k.w. at the substation, or 264 at the generating station, allowing the same percentage of loss as above. These trains making the same schedule speed at double the headway will be spaced 40 miles apart and the generating capacity will therefore be 528 k.w. every 40 miles, or 13.2 k.w. per mile. The substations consisting of two 400 k.w. units (with reserve) every 9.1 miles will have capacity per mile of 88.0 k.w. Expense for cars will be the same as before and the following approximate costs obtain:

Approximate First Cost Per Mile. Two Car Train.	
Generating station	$1,320
Substations	3,080
Equipments	1,120
Total	$5,520

The first cost of the two-car train system will be $5,520 as against $4,430 with single-car train. The energy consumed for the two methods of operation is 17 k.w. per mile of track with single car as against 13.2 k.w. per mile with two-car train. Thus, while the two-car train at one hour headway will cost 24½ per cent. more to install (for the items mentioned only) it will consume but 72.5 per cent. of the energy required to operate a single car individually.

The difference in power required, is 3.8 k.w. per mile of track. Assuming 12 hours per day operation at the above headway, the total k.w. hours per day will be 45.5, which at $.007 per k.w. hour would be $116.50 per year, or 10 per cent. on $1,165. It would therefore pay to invest the $1,090 per mile of track difference in cost between one car and two car operation, as found above, provided the same receipts could be secured with one hour headway as with 30 minute headway. The relation of traffic receipts and frequency of travel is a question which can only be determined experimentally, and while the desirability of the two-car service seems evident from the data at hand in the above case, it might result in a falling off of receipts, to such an extent as to more than make up the saving in operating expenses. There is an additional saving in train crew expenses which was not entered into above, and which would amount to something more than half as much as the cost of power. With two-car operation, it is possible to reduce the motor capacity per car from four 110 h.p. motors to four motors of approximately 95 h.p., thus reducing the cost of the equipment item. Owing to the fact, however, that it might be desired to operate a single car during certain parts of the day, which would result in overheating the smaller motor equipment, it would be more conservative to consider the same size motor whether a one-car or a two-car train is operated. The substations with two-car trains being placed somewhat closer together would have a labor account per mile of track in excess of that for single car operation. This may be balanced against the saving which would result from smaller crew expenses of the two-car train. . . .

For the slower speed work where stops are more frequent and where acceleration is a more important factor, it will be necessary to have more complete curves in order to determine the proper rate of acceleration, especially if the problem is one calling for very high schedule speeds in relation to the number of stops.

The writer is indebted to Mr. E. F. Gould for valuable assistance.

The Cutting and Laying of Ties.

By HERMAN VON SCHRENK, *U. S. Dep't of Agriculture.*

While it is doubtless true that a good many features of practical railroad operations are so self-evident that every one ought to practice them, one now and then finds that these features are so self-evident that it is not thought worth while to call attention to errors. My attention has been directed repeatedly during late years to the manner in which ties are laid in the track, and to possible reforms directed towards obtaining longer life out of ties. One of the commonest errors made deals with the way in which a tie is laid in the track. Everyone seems to know that when two ties are cut from a single cross section of a tree, that these ties should be laid so that the concave side of the annual rings is on the upper side. Fig. 1* shows the incorrect way of laying such a tie, and Fig. 2 the correct way in which it should be laid. This is particularly true of the sawed ties of coniferous wood, i.e., pine, cedar, hemlock, spruce, etc., which are coming into use more and more, and especially of such ties after they have been treated with some preservative.

There are three reasons why the timbers should be laid in the position shown in Fig. 2. The first one is a mechanical one. The tendency of a wood-ring when drying is to straighten out. This results in checks on the side towards the center of the tree. When laid in the position shown in Fig. 1 the tendency to straighten out, and consequently the tendency to check is increased and assisted by the weight of the rail on the timber.

The second reason is also a mechanical one. The tie laid in Fig. 2 forms a series of arches sustaining a load, while the one laid in Fig. 1 forms the very opposite.

The third reason has to do with the drainage of water in the wood. While there is no absolute cup formed (as is sometimes supposed) when the tie is laid as shown in Fig. 1, i.e., with the convex side of the wood rings downward, it is nevertheless true that in this position there is a greater tendency for the water to remain in the wood. It will evaporate most rapidly from the top of the tie, and with the tendency to straighten out on the part of the wood rings, checks and cracks will result which admit more water. This leads not only to a weakening of the tie, but hastens decay. When laid so that the concave side of the rings is downward as shown in Fig. 2, there is no such tendency to crack and the drainage is downward and out of the tie.

The arguments for laying ties as shown in Fig. 1 is applicable especially to ties treated with a preservative like zinc chloride, which is soluble in water.

The interest recently awakened in more economical methods of cutting ties from trees leads the writer to call attention to the necessity of considering the relation of the tie position and the direction of the curvature of the wood rings, when cutting more than one tie from a tree. The method of cutting triangular ties, such as are now used by the Great Northern, shows this to a marked degree. It was probably the intention originally to cut four triangular ties from a tree as shown in Fig. 3. Many ties have, however, been cut from smaller trees, making two ties, as shown in Fig. 4. When these ties are laid with the point down, they have the wood rings sloping the wrong way, and the tendency is for pieces to split off whenever these ties are handled. This also happens when these ties are drying and checking. Such a tie the writer considers almost dangerous, for when a spike is driven into them at any point, not exactly in the center, they are liable to split at any time under the severe strain exerted by the spike. Fig. 5 shows a photograph of a triangular tie, cut two from a tree, which is wrong. Fig. 6 shows a similar tie cut correctly, i.e., four from a cross section. While economy in the use of timber is at all times to be urged with all possible force, one should be careful to do so only in such manner that serviceable material is obtained. It may not be out of place to say a word of warning at this time when we are looking for economical tie forms, so that we may not go to extremes, and thereby do harm to a praiseworthy effort. Ties such as the one shown in Fig. 5 should under no circumstances be used.

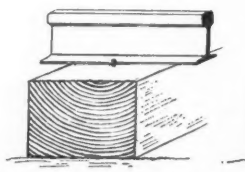


Fig. 1.—Tie Not Properly Laid.

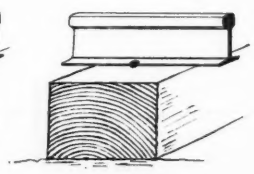


Fig. 2.—Tie Properly Laid.

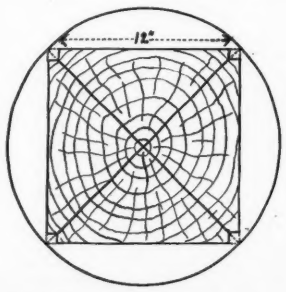


Fig. 3.—Triangular Ties Cut 4 From a Tree. Correct Method.

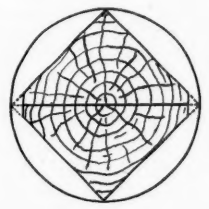


Fig. 4.—Triangular Ties Cut 2 From a Tree. Incorrect Method.

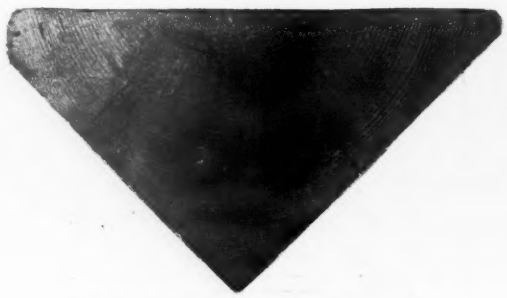


Fig. 5.—Triangular Tie Cut Incorrectly.

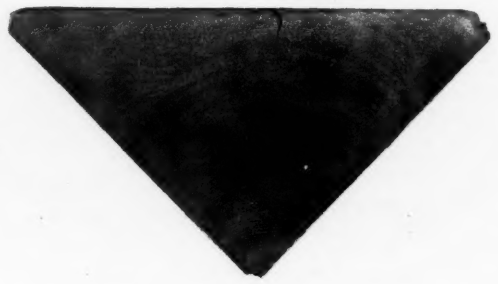


Fig. 6.—Triangular Tie Cut Correctly.

*Figs. 1 and 2 are taken from a recent circular issued by Mr. H. U. Mudge, Gen'l Manager of the A., T & S. F. Ry.

Atlantic (4-4-2) Type Locomotive for the Chicago, Milwaukee & St. Paul.

Two classes of Atlantic (4-4-2) type locomotives are building at the Baldwin Locomotive Works for the Chicago, Milwaukee & St. Paul. The heavier engine (Fig. 1) was illustrated in the *Railroad Gazette*, Sept. 20, 1901, and is used in hauling the fast and heavy trains be-

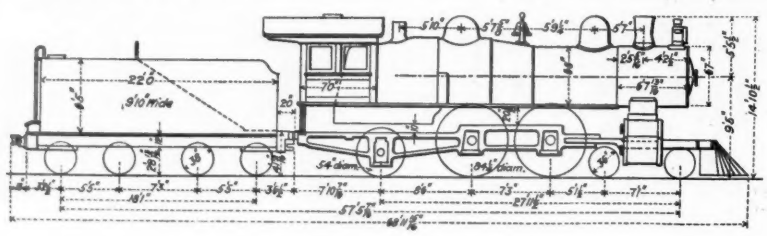


Fig. 1.

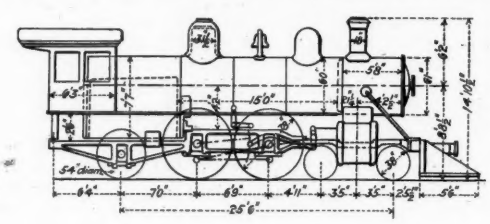


Fig. 2.

Atlantic (4-4-2) Type Locomotives for the Chicago, Milwaukee & St. Paul.

tween Chicago and Milwaukee. The lighter engine (Fig. 2) is intended for use on some of the divisions where the passenger traffic has increased so that heavier power is needed, but where the service is not severe enough to warrant the use of the heavier engine (Fig. 1). The lighter engine (Fig. 2) is large enough to do the work and will be much easier on the track than the heavier machine. Both engines have the same size tender.

A table of principal dimensions of both classes is given below:

	Engine.	
	Fig. 1.	Fig. 2.
Total weight, lbs	177,470	150,400
Weight on drivers, lbs	92,450	80,400
Cylinders, in.	15 & 25 x 28	13 & 22 x 26
Heating surface, sq. ft	3,198	2,245
Diameter of drivers, in	84¼	78
Grate area, sq. ft	46.7	30
Length of tubes, ft. and in	16—6	15—0
Htg. surface divided by grate area	68.4	75.0
Wgt. on drivers divided by htg. surf.	28.9	35.8
Steaming capacity*	.21	.197

We are indebted to Mr. A. E. Manchester, Superintendent Motive Power, for the diagrams.

Tank Car for the Southern Pacific.

The Standard Steel Car Co., Pittsburg, has recently built a number of all-steel tank cars for the Southern Pacific, the drawings of one of which are shown herewith. They are known as class C.S.—25a., and the tanks have a capacity of 12,500 gallons or 100,000 lbs. The car is 40 ft. long over end sills and 9 ft. 2¾ in. wide over all, with an extreme height from rail to top of dome cover of 13 ft. 2⅝ in. The tank is 36 ft. 4⅜ in. long and 94¼ in. in diameter inside. It is carried on seven saddles which are built up of angles and plates and extend across the car from side sill to sill, resting on top of the sills as shown in the cross-section. All of the tank seams are double lap riveted with ⅝ in. rivets and 4 in. lap. The plates are $^{5}/_{16}$ in. thick except the tank heads, which are $^{7}/_{16}$ in. The tank straps are fastened to the saddles by jaw bolts working in turnbuckles to take up slack. A heavy wooden-head block at each end, secured by bolts through a gusset plate to the side sills, prevents the longitudinal displacement of the tank. These head blocks are tied from end to end of the car by two 1¼ in. rods and straps running around the tank ends further strengthen the tank against movement. These straps are riveted to the side sills in the center of the car and have a turnbuckle in the rods to allow for expansion.

The underframe of the car is similar to the underframes made by the same company for other classes of cars. The center sills are 15 in. channels reinforced between the bolsters for a distance of 20 ft. by a heavy angle riveted to the web and extending down below the flange as shown in the section AA. The side sills are 10 in. channels with a reinforcing piece riveted outside to form a fish belly girder 20 in. deep at the center of the car. A heavy cover plate is riveted across the top of the center sills but no bottom plate or lattice work is used on the under side. The bolsters are of I section built up from plates. The end sill is a pressed shape extending out from the ends of the side sills and backed up by the extension of the center sill splices. A light running board with a hand rail next the tank is supported well up on the side on brackets riveted to the tank bands, and the brake wheel is handled from the small projection formed by the end sill. Arch bar trucks of 100,000 lbs. capacity are used under these cars.

*See *Railroad Gazette*, June 19, 1903, p. 441, for formula used in calculating steaming capacity of compound locomotives.

Pensions on the B., R. & P.

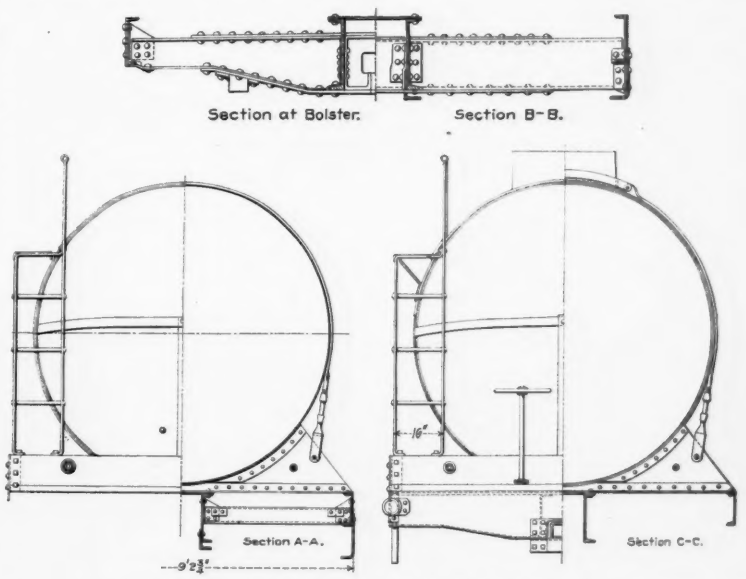
The Buffalo, Rochester & Pittsburgh now pays pensions to superannuated employees, the plan adopted by the directors in April last having been put in effect on July 1. The allowance is more liberal than on the other roads which pay pensions, and the age of compulsory retirement is 65, the same as on the Lackawanna; on the other roads paying pensions it is 70 years. On the B., R. & P. the employee must retire at 65, but he does not receive a pension unless he has been 20 years in the service. Retirement is not compulsory for executive officers elected or appointed by the Board of Directors. Employees 60 to 64 years old who have been in the service 20 years may be retired and pensioned if incapacitated. Any faithful employee incapacitated by injury may be retired and granted a pension, either for life or for a limited time.

The basis of the pensions is 2 per cent. of the average pay for the 10 years preceding retirement, multiplied by the number of years of service. Thus, a man who has served 40 years and who for 10 years has earned $75 a month receives a pension of $60 a month. The total payments for pensions in a year must, however, come within $25,000. No assignment of pensions will be recognized. Pensioned employees may engage in other business not prejudicial to the interests of the railroad company. No new men will be employed over 35 years old, except that experienced persons are eligible up to 45 years. Exceptions to this rule are (1) former employees within three years after leaving; (2) persons required for professional or other special services; (3) for temporary work not exceeding six months.

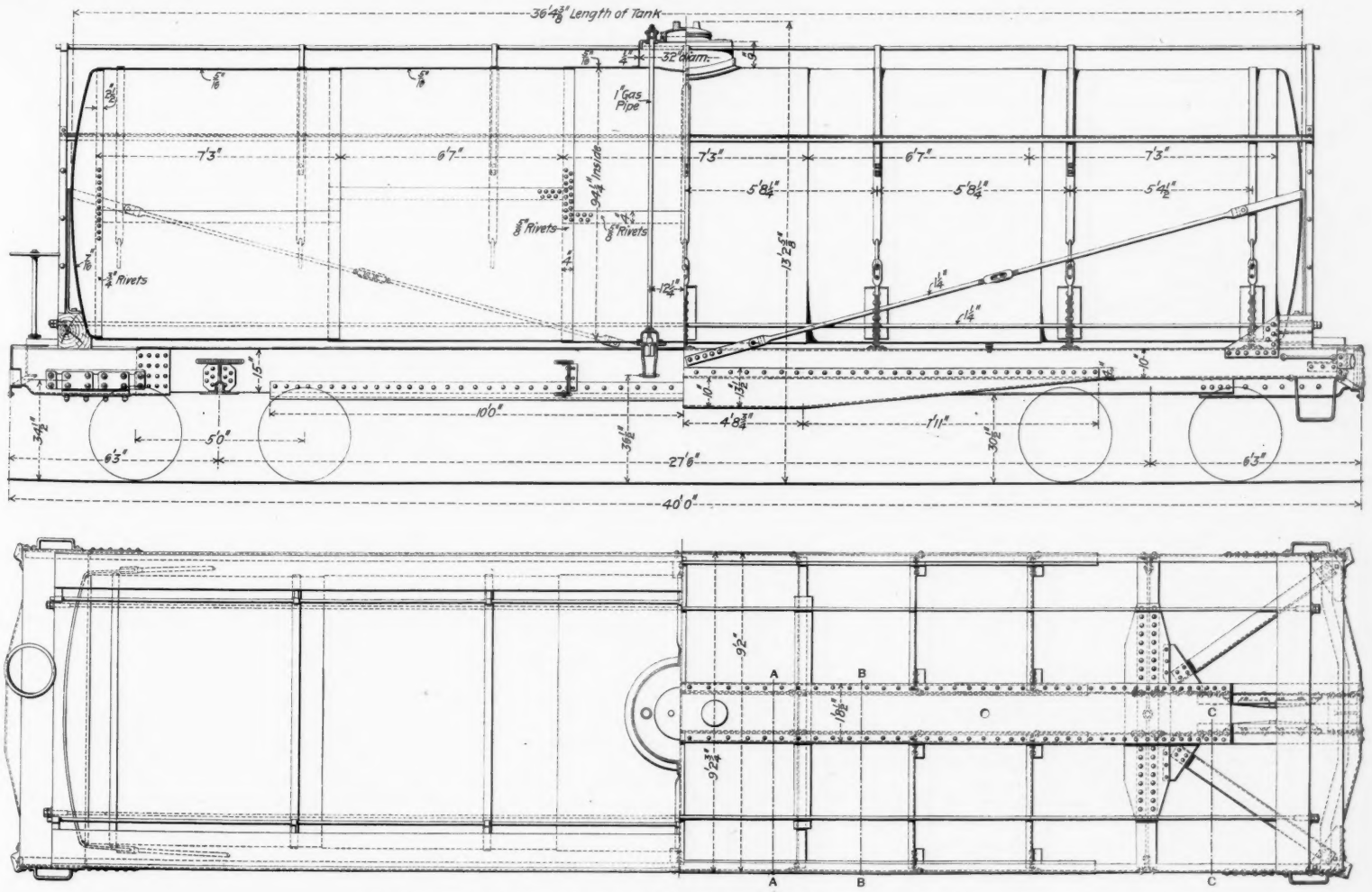
The principal features of the pension regulations on six American railroads were given in the *Railroad Gazette* of Feb. 28, 1902, page 142.

The Pekin-Hankau R. R.

Work on the Pekin-Hankau R. R. is now being carried on at both ends of the line. The southern section between Hankau and Sinyang, 125 miles, has been finished and is open for traffic. From Sinyang to Sinantien only freight trains are running at present. The laying of tracks between Sinantien and Siphing is expected to be finished by October of this year, while preparations are now being made for the grading for the line from Suiping east to Huchow. The railroad connection between the last mentioned town and Kaifong, in the Province of Honan, 400 miles, will, it is reported, be completed within two years. At the northern terminus of the line the section between Pekin and Chingting, 180 miles, is already open for traffic. Between Chingting and Shunte, a distance of 80 miles, freight trains are running, and it is expected that this will be open to passenger traffic before the end of July. The work on the line will be finished as far as Weihui before the end of the year. The distance from Weihui to Kaifong is only 50 miles, and work on this section will probably be completed early in 1904. It may therefore be roughly estimated that a direct connection between Pekin and Hankau by railroad will be established within the next two years.



Cross-Sections of 12,500 Gallon Tank Car—Southern Pacific.



Sectional Plan and Elevation of 12,500 gallon Tank Cars—Southern Pacific.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The effect of head end air resistance on the power consumption of single car trains at high speeds is perhaps not fully appreciated. But few experiments have been made to determine the value of this resistance. Most train resistance formulæ have been obtained in connection with steam locomotives in which the drawbar pull behind the tender and the train load have been the determinate factors while the head end resistance is charged against the locomotive. That is to say, the difference between the cylinder horse-power and the drawbar horse-power represents the power absorbed by the head end resistance and the machine and rolling friction of the locomotive. Elaborate tests were made in connection with the Berlin-Zossen high speed electric trials. Pipes of different diameters were passed through the front of the car and were connected inside to recording gages. These tests indicated that a uniform cone of compressed air was pushed ahead in front of the car and that the cone, for the car in question, was about 11 feet long. From the data thus obtained the following formula was computed showing the relation between the pressure (P) on the front end in lbs. per sq. ft. and the velocity (V) in miles per hour:

$$P = .00265\ V^2$$

Assuming that the superficial area of a standard electric coach is about .75 sq. ft., the following table is given showing the total pressure and the power required to overcome that pressure at various speeds:

Speed, M. P. H.	Total pressure, lbs.	Horse-power.
20	79.5	4.24
40	318	33.92
60	715.5	115.28
80	1272	271.36
100	1987.5	530

It will be seen that at speeds below 40 miles an hour the effect of head end resistance is practically negligible but at speeds of 60 miles an hour or more the power required to overcome head end resistance is by far the most important element in train resistance. As the number of cars in a train is increased, the relative effect of head end resistance is decreased.

The impudence of the labor leaders seems to have reached the climax of arrogance in the denunciation of President Roosevelt by a western trade union as guilty of treason because as the executive head of the government, sworn to uphold the law and maintain order, he made preparation to avert a labor riot in Arizona. As shown by the chronicle of the last few years their rake's progress is worthy of Hogarth's pencil. The labor agitators began with the assertion that a man should not be allowed to work without a union card; then came the declaration that a man who did not employ trade union members should be driven out of business; then violence, maiming and murder and the justification of rioting as a revolutionary right; then municipal officers who have sought to maintain the conditions whereunder citizens could work as they choose have been proclaimed as public enemies, governors who have sought to quell public disturbance have been slandered and the names of judges who have decided under uncontroverted law in favor of the rights of the non-unionist have been pilloried. Trade unions have forbidden their members to belong to the militia, and now one of them denounces the President as guilty of treason. A negro who outraged and murdered a young girl is burned at the stake, and we are told that the sentiment of a northern community approves of this punishment, but the trade unions which have outraged the peace of homes, the rights of citizens, the progress of industry, the sanctity of the law, whose members within a year have been guilty of arson, robbery, murder, riot, personal assaults innumerable, contempt of the law and defiance of its servants are daily and weekly allowed to continue in this course, and apparently raise no more than a ripple, if even so much, in the current of that public opinion which is reverenced as the mainstay of our institutions.

The Proposed Grand Trunk Pacific.

In the Dominion of Canada the newspapers, members of parliament, and others, are at present discussing with deep interest the proposal to build a new northern railroad line from the Atlantic to the Pacific. The first cost and the risk is to be the government's burden. Inasmuch as there seems to be a likelihood of the construction of at least a portion of the line, the proposition seems worthy of attention. The Atlantic port is designed to be Moncton, N. B., and the Pacific terminus is at Port Simpson, about 550 miles north of the Canadian Pacific at Victoria. Quebec and Winnipeg are specified points on the route. Judging from the Canadian newspaper discussions, advocacy of this scheme seems to increase in intensity with equal steps westward, while the opposition is in the eastern part of the Dominion. The dividing line seems to be between Montreal and Toronto.

It is proposed that the Dominion government shall build directly a new line from Moncton, keeping well south of the Intercolonial road and crossing it at or near Point Levi, opposite Quebec. From there it will continue westward on the middle ground between the Canadian Pacific and Hudson Bay until it touches the Canadian Pacific at Winnipeg. The Grand Trunk Pacific company, a new corporation, is to build the road from Winnipeg to Port Simpson. The government is to lease the Moncton-Winnipeg line to the Grand Trunk Pacific company for 50 years; for the first five years of which no rent is to be paid; for the second five years at a rental of the operating profits up to but not exceeding 3 per cent. of the construction cost; and for the remaining 40 years at a firm 3 per cent. of the construction cost. The Grand Trunk Pacific company is to build the Winnipeg-Port Simpson line for the Dominion government's guarantee of its 3 per cent. bonds to the extent of three-fourths of the cost of construction, but it is specified that the construction cost shall not exceed $13,000 a mile for the prairie sections and $30,000 a mile for the mountain sections. The estimated amount of these government guarantee bonds is 70 million dollars. The estimated amount of the Winnipeg-Port Simpson construction is 100 million dollars. The Grand Trunk Pacific will furnish the equipment for the entire line.

It seems difficult to understand the proposition to build the new line from Moncton to Quebec. The Intercolonial Railway at the present time furnishes an all-rail line between these points. It follows approximately the Atlantic coast, some navigable rivers and the St. Lawrence River. It reaches nearly all of the towns in that part of the Dominion, and serves well for both local and through business. It is owned by the Dominion government and has cost something more than 61 millions. On this capital sum it not only pays no interest, but it is operated at a loss of nearly $500,000 a year. It is proposed that the new line shall be shorter, passing through the interior, which is a magnificent wilderness forest country, with few inhabitants. If any new eastern extension from Quebec to the Atlantic is worthy of consideration it is surprising that the possible income from a new line from Quebec, north of the St. Lawrence River, to a seaport at the mouth of the Saguenay River has not been studied out. A grand harbor and the shortest ocean route to England should make this scheme attractive and possibly profitable.

From Quebec westward to Winnipeg the line is largely through virgin forest; a wonderful land of spruce and pine. With the conception that most of us have of the office of government, it may be that this is as wise an undertaking as was the original building of the Union and Central Pacific roads by government guarantee. Although it cannot possibly be directly profitable for many years, nevertheless, it may be profitable in the larger sense; it will open up the country and make it available for industries.

From Winnipeg westward, through what is said to be a great possible wheat country, the promoters of the enterprise apparently find little difficulty in convincing people not only that the line should be built, but that it may be profitably built and operated. The results of the experience on the Northern Pacific, the Great Northern and the Canadian Pacific are quoted with confidence. The selection of Port Simpson as a terminus will give this road two great advantages over the other railroads which have been built to the Pacific coast. The harbor of Port Simpson is only about 300 miles, by an inland sea route, from Skaguay, the terminus of the White Pass & Yukon R. R. A direct line of travel can therefore be opened up with Dawson and the vast territory of Alaska. Port Simpson is also the nearest port to China on the Pacific coast, and, with a good line of steamers, would present possibilities of trade with the Orient.

A Freight Embargo Justified.

A decision just published by the Interstate Commerce Commission is of more than passing interest (although it concerns directly a controversy of little consequence) for the reason that it deals with a new railroad practice, the freight embargo; new in the sense that it is only since the adoption of the per diem basis of settlement for car-hire, one year ago, that the railroads have formally recognized the embargo as a regular means of adjusting traffic conditions, and one to be frequently and generally applied. The decision, written by Commissioner Yeomans, looks upon the embargo declared by the Baltimore & Ohio in December last as reasonable and necessary, and the consignee's complaint is dismissed. The case was that of S. S. Daish & Sons, Washington, D. C., buyers of hay, against the Cleveland, Akron & Columbus and the Baltimore & Ohio. A carload of hay from Condit, Ohio, was 65 days on the road, and the consignee claimed damages in the sum of $1,159. Commissioner Yeomans finds that during the great strike of anthracite coal miners, lines like the Baltimore & Ohio, carriers of bituminous coal, suffered from an unprecedented congestion of traffic. In consequence of this congestion the Baltimore & Ohio issued embargo notices December 26, January 5 and 28 and February 5. In these notices perishable freight for all places and freight of all kinds for certain territory, were exempted. The B. & O. undertook, as far as possible, to give precedence to freight originating on its own lines. Evidence was offered to show that similar embargoes were made by other roads. Evidence was introduced on behalf of the plaintiff to show that some hay was carried through in spite of the embargo. The conclusion of the commission is that the defendant probably had the right to give bituminous coal the preference: also to favor live stock and perishable goods and material for the railroad company. The embargo notices to connecting lines were proper, and it was right to forward in the order of their receipt those cars which were accepted. Only two cars slipped through the embargo; it was therefore "practically maintained and enforced, and no cause exists for any complaint of discrimination in favor of individuals. Neither does there appear to have been any undue preference given to localities to the undue prejudice of complainant, or the dealers in Washington and Baltimore; there being a general inability to supply cars as well as engines for the movement of freight. The necessity for keeping open for traffic the two main tracks of defendants' lines east of Cumberland required great care so that passenger travel and extraordinary and necessary freight transportation should not be obstructed or interfered with."

The report of the Russian railroads for 1899 contains for the first time some statistics for the railroads in Asia, namely, the Asiatic Midland, from the Caspian Sea eastward, built across the desert primarily for military purposes, to fertile valleys at the foot of the mountains: the Ussuri Railroad, from Vladivostock northeast to the Amoor River, originally intended as the Pacific section of the Siberian Railroad; and the Siberian Railroad itself, then in operation only as far east as Lake Baikal. The traffic on these railroads is naturally light, equivalent on the average to 196 passengers and 402 tons of freight each way daily. The Siberian Railroad must have had a large amount of construction freight. The Asiatic railroads show an average rate per ton per mile of a little less than 1 cent, while the average of all the Russian railroads was 0.86 cent. The passenger traffic was encouraged by an average rate of 0.3514 cent per mile, against an average for all Russia of 0.6304 cent—the latter being lower than anywhere else in the world

except India, and the Siberian rate the lowest in the world, doubtless due to the extremely low rates for immigrants from European Russia; though the rates for other passengers are very low, and doubtless far below cost. As Siberia is for the most part public domain, the policy of carrying for less than cost people to it who may make it worth something may not be condemned offhand. Moreover, European Russia is certainly now overcrowded with an agricultural population, and room needs to be found for the surplus either by an improvement on the deplorable methods of cultivation now followed, which the peasants will be very slow to learn, or by opening new territory. The gross earnings per mile of Russia's Asiatic railroads in 1899 were $340 from passengers and $2,667 from freight. Many railroads in this country have existed on no more than this, but none of them accepted 0.35 cent per passenger-mile and 1 cent per ton-mile—generally they have received several times as much. The railroads in Asia, moreover, have elements of expenses greater than most of those in Europe.

The man who makes the proverbial increase of 100 per cent. in the grass-crop, on a unit basis, is not more obscure and unassuming, or destined to a more prosaic life, than the railroad officer who devotes his time to making shippers and agents economical in the use of freight cars; but the officer, like the tickler of the earth, is entitled to commendation. He is as useful as the passenger agent, with his diamond pin and his pocket full of complimentary dining car tickets. The man who performs this duty on the Baltimore & Ohio has saved nearly 5,000 coal and coke cars a month, as appears from the following figures: In April, 1903, there was loaded on the system, exclusive of the Baltimore & Ohio Southwestern, 372,159 tons of coke into 15,562 cars. At the rate of loading obtained in April of last year, this coke would have required 16,526 cars, so that there was a saving of 964 cars, due to better average loading per car. In the same time on the same divisions there was loaded 1,416,207 tons of soft coal; loaded into 40,808 cars. At the rate of loading last year, this tonnage would have required 44,689 cars, so that there was a saving in the use and movement of 3,881 cars in April, 1903, over April, 1902, due to better average loading per car. For the 10 months to April 30, 1903, the saving over the corresponding period of the preceding fiscal year was 42,639 cars. These figures cover commercial shipments only; the company's fuel is not included. It will be seen that the saving in coke cars was about 6 per cent., and in coal cars 9½ per cent.

The "Lapland Express" is the latest candidate for the patronage of the globe-trotter, and it really ought to afford a new sensation. It began running once a week June 19 from Stockholm northward 983 miles, following closely the eastern border of Sweden and crossing into Norway beyond the Arctic circle over the new railroad to Narvik, on the Ofoten Fiord of the North Sea. Less than 25 miles of the railroad are in Norway. The express leaves Stockholm at 4:05 p.m. Friday, and reaches Narvik at 4:45 p.m. of the Sunday following, making an average speed of a little more than 20 miles an hour. The ordinary trains, which run daily, take 64 hours for the trip. The Lapland express has only sleeping cars (first class) and a dining car. The passenger pays $17.40 for a first class ticket and $13.40 for the "express" and sleeping car accommodations. Some 175 miles of the northern part of this route were built especially to carry iron ore to the port at Narvik, and very large shipments are expected. This express will not run after Sept. 15.

NEW PUBLICATIONS.

Earthwork and Its Cost. By H. P. Gillette. New York: The Engineering News Publishing Co., 1903; 244 pages.

This book shows clearly and simply 11 of the methods of moving earth; but the assertion that such a book is "the first published volume treating of earth economics in a comprehensive way" is not justified. The comprehensiveness consists in the breadth of view of a man who has both planned and done the work.

Most interesting, from the contractor's standpoint, is Mr. Gillette's plea for a better and fuller understanding between the engineer who makes designs, specifications, and lets the contract and his associate, the contractor, who does the work. It is true that the party of the first part often has the whip hand until the work is started. This power is most commonly used to enforce a construction of the contract which may be used as a club over the contractor; such as "work to be completed to the satisfaction of the engineer in charge"; or a clause threatening to summarily declare the contract void if "in the engineer's opinion" progress of the work is not satisfactory. The introduction to the book should make the results of such a policy as clear to the designing engineer as it is now to the contractor who makes different prices to different companies for similar work.

The insurance which contractors require on account of insufficient determination of the quality of material and a consequent effort to draw specifications so as to avoid a bill of extras, is an item chargeable directly to those who let the contract, minus only the cost of getting such information.

The book goes in detail into the cost and method of handling earth by wheelbarrows, carts, wagons, scrapers, elevating graders, steam shovels and cars. It should be valuable as a book of reference to the experienced man. To the student it shows a sound and rational method of dealing with the subject.

Electrical Engineering. By E. Rosenberg. Translated from the German by W. W. Haldine Gee and Carl Kinzbrunner. New York: John Wiley & Sons, 1903. Price $1.50.

This book had its origin in a number of lectures delivered to the workmen and the staff of a large electrical manufacturing firm and it is intended in its present form to interest and be of value to that class of readers. It can in no sense be called elementary since it deals with the most highly developed forms of electrical machinery, yet it is so worded and so arranged in the logical development of the underlying theories of electricity that no particular knowledge of higher mathematics or the fine points of engineering is necessary for a thorough understanding of the subject. The book will not enable the reader to calculate the parts and windings of dynamos or motors, nor is it intended to do so since for the student beginner, the engineer or the general public it is quite sufficient if they understand the working of dynamos, their faults and the reasons and cures for the latter. It is bound in cloth and contains 280 pages and 263 figures with a good index.

Specifications for Steel Structures. American Railway Engineering and Maintenance of Way Association, 1562 Monadnock Building, Chicago. Single copies, 10 cents.

Secretary E. H. Fritch, of the above-named association, has printed a pamphlet of 10 pages containing the specifications for material and workmanship for steel structures as adopted by the association at its last annual convention. The chairman of the committee reporting these specifications is Mr. J. P. Snow, Bridge Engineer of the Boston & Maine, Boston.

TRADE CATALOGUES.

The New York Continental Jewell Filtration Company has issued an artistic 36 page catalogue illustrating and describing the filtration plant built by it for the East Jersey Water Company at Little Falls, N. J., on the north bank of the Passaic River. The works will have an ultimate normal capacity of 32,000,000 gallons per 24 hours and will supply the cities of Paterson, Passaic and Montclair. An abstract of a paper by Mr. G. W. Fuller, Assoc. Mem. Am. Soc. C. E., gives the results of tests under different conditions of operation. It is interesting to note that during the month of January, 1903, the number of bacteria per cubic centimeter in the river water was 5,800, while the water after passing through the filters contained but 50 per cubic centimeter.

Fishing and Hunting is the title of a thick pamphlet published by the Chicago & North Western, as a guide to the fishing and shooting resorts in Wisconsin and Michigan reached by the North Western line. There are articles on "Black Bass," "How to Catch the Mascalonge" and "Bait Casting as an Art," by Fred. Gardner, the well-known sportsman; and four articles by Geo. W. Strell, editor and manager of the *American Field*, on "How to Distinguish Fish," "Fly Fishing," "Deer Hunting" and "Ruffed Grouse Shooting." A large number of the resorts where good sport may be found are briefly described, and there is an alphabetical list of stations and resorts, giving the kinds of fish and game to be found at each.

Ferguson Oil Furnaces.—The Railway Materials Co., Chicago, Ill., has issued a handsome catalogue describing the uses of these machines in and around railroad shops and manufacturing plants. They are largely used for welding flues, heating rivets, bolts, or forgings, case hardening, spring banding and fitting and general annealing and tempering work. The Ferguson portable heater, also described, is a useful tool in repairing steel cars or in other work where a local application of intense heat is required. The general dimensions of each type of furnace are given on the drawings, together with a brief description of the construction.

Berquist Suspension Bunker is the title of a catalogue issued by A. S. Berquist, Brooklyn, N. Y., describing his storage bin system for storing coal, broken stone or any granular material in bulk. The peculiar feature of this bunker is the curved shape which eliminates all bracing. This curve given to the bottom of the bunker is a true equilibrium curve and the material in the bottom is subjected to tension only so that when loaded the bunker has no tendency to change its shape. The growth of this type of storage bin has been very rapid and in 1902 there had been erected plants with a total capacity of 150,000 tons.

The Buffalo Forge Co., Buffalo, N. Y., has published a little pamphlet in which are described most of the machines comprising its special line of gas blowers and exhausters. These machines are similar in appearance to other types of Buffalo fans but in the design and construction of the wheels and other parts they differ somewhat to make them particularly adapted to their work. A table of sizes, capacities and prices is given with the description of each fan.

The Watson-Stillman Co., New York, has issued catalogue No. 65 to replace catalogue No. 51, issued four years ago. It is a complete illustrated index of the tools made by this company, covering hydraulic machinery and fittings of every description. There are some 600 engravings reproduced on a small scale from the separate sheets issued from time to time by the makers. A complete description of each tool is given on these separate sheets which may be had on application.

Carbonizing Coating Protection, issued by the Goheen Mfg. Co., Canton, Ohio, is a 28 page pamphlet, 8 x 11 in., describing the protective coating for iron and steel structures which is made by the company. There are chapters on prefatory cleaning; on the durability and covering capacity of various protective paints; on oxide paints, graphite paints, red lead, linseed oil, etc. The pamphlet is illustrated with 30 large photographs of treated structures.

Boring and Turning Mills.—The Bullard Machine Tool Co., Bridgeport, Conn., has just sent out a handsomely illustrated catalogue, or rather a treatise, on the possibilities of boring and turning mills for general machine shop purposes. A number of characteristic operations with these tools are shown illustrating the nature and the variety of work which may be done with them.

C. W. Hunt Co., New York, in its catalogue No. 035 gives a brief description of a few of its many specialties in coal handling machinery for power stations, shipping docks, coaling stations, etc. Reproductions from photographs and cross sections of a number of characteristic installations show the applications of Hunt machinery in large industrial and municipal power plants.

The Westinghouse Electric & Mfg. Co., Pittsburg, Pa., has published an illustrated pamphlet entitled "Electricity in Mining," which contains a number of photographic reproductions showing electric mining equipment, with comparisons of the comparative efficiency and economy of different hauling devices. Copies will be sent on application.

Famous Colorado Resorts is the title of a little book sent out by the passenger department of the Missouri Pacific system, in which the attractive features of a number of delightful summer resorts are enumerated and the way to reach them described. It is handsomely illustrated with many views of the hotels and surrounding country.

The Training of the High-Tension Engineer.

"There are two schools in which the electrical engineer may receive his training, but only one in which he must receive a course before he can be called a high tension engineer. Those things which are learned in the schools equipped with professors and laboratories and mathematical text books must be supplemented by the things which can be learned only in the school of experience. These two schools are quite different in method. The college instructs in theory and in those methods of doing things which have become standard by universal adoption. The college teaches positive knowledge. In the school of experience, on the other hand, one is more apt to learn how not to do it, and by the elimination of the successful, arrive at the goal of success. The knowledge gained by experience is more often negative.

"Put to the fresh college graduate the problem of the amount of distance to be left between the conductors of a high tension transmission line. His answer will involve most likely the jumping distance of the voltage to be used, the length of span, the sag and perhaps a liberal factor of safety. It is experience only that will show that his premises are wrong and that the equation to determine spacing of high tension wires depends very little on the voltages to be carried and almost entirely on such things as the average length and ohmic resistance of cats, the spread of wing of owls and cranes and eagles, and the average length of scrap baling wire, together with the strength of the average small boy's throwing arm. The graduate has learned how to make accurate measurements of power. He finds after he has been 'up against it' that it is easier to measure power accurately than it is to persuade the customer that his power is being accurately measured.

"The newly made graduate usually has a high opinion of efficiency and can calculate the economy of a transmission to an excessively small fraction. When he becomes responsible for the operation of a transmission line, however, it does not take him long to find out that efficiency is a vanishing quantity when compared to continuity of operation, and that economy is not to be considered as being in the same class as good service. The technical graduate, in short, may have knowledge aplenty but his wisdom is to come.

"The technical course is the best of foundations, but it is only a foundation. The end of the college course is rightly called 'commencement.' The great advantage of the technical education is that it gives the man proper equipment for overcoming the difficulties with which his experience is bound to bring him into contact. It gives him, as nothing else will, the power of initiative—that most valuable quality that a high tension engineer can possess. There is nothing like the college education to equip a man for making every accident a lesson in 'how not to do it,' and every failure a stepping stone to success."—P. M. Lincoln before the Canadian Electrical Association, June 10, 1903.

Heating and Ventilation of the New Office Building of the American Blower Company.

The American Blower Company has recently completed a new office building at Detroit, Mich. The old offices were in one of the factory buildings and became too small for the growing business. The new building has two stories and a basement and is occupied by the commercial departments on the first floor, and the engineering and drafting departments on the second floor. The basement is used for the storage of catalogues, letter files, etc. On the roof is a small building for blueprint and dark room.

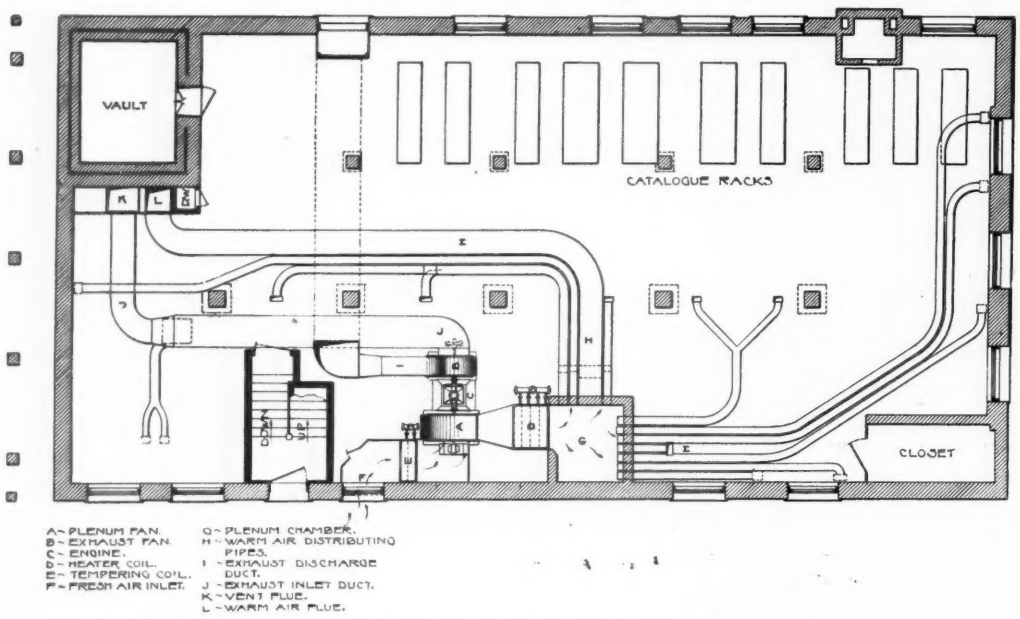
The heating and ventilating of the building represents the latest and best practice. The apparatus is located at one side of the basement, as shown on the accompanying plan. The fresh air enters the building through the basement window, F, and is drawn over a coil of pipes, E, called the tempering coil, by the fan A. The steam pipes in this coil are just sufficient in number and length to heat the volume of entering air to a temperature of 65 or 70 deg. Fahr. The air passes through the fan and is forced over the main heater, D, which heats the air to about 140 deg. Beyond the heater is a large brick chamber, G, called the plenum chamber, which serves as a reservoir for the heated air, and from which the air passes by galvanized iron pipes, H, to the various offices. Under the main heater is a passage or by-pass which permits a part of the air from the fan to pass under the main heater coil and into the lower section of the plenum chamber, which is separated from the upper part as shown by the accompanying sectional elevation. The upper chamber contains hot air at approximately 140 deg., and the lower section tempered air at 70 deg. Each individual pipe leading off to the offices above has two connections to this plenum chamber, one branch to the upper section and another to the lower. In each main, where the pipe branches, there is located a set of double-swinging or mixing dampers, which are controlled automatically by a diaphragm valve, which is part of a system of automatic heat control furnished by the Johnson Service Company, Milwaukee, Wis. The valves are operated by compressed air supplied by a small compressor in the basement worked by city water pressure and delivering air at about 15 lbs.

The system of temperature regulation is simple and satisfactory. In each office is a thermostat working upon the principle of the unequal expansion and contraction of brass and steel, which can be set to control the room temperature at any desired point. They are all connected by ⅜-in. head pipes with their respective diaphragm valves. The mixing dampers do not cut off the flow of air, but simply vary the proportion of hot and tempered air to maintain a constant temperature in the room. Under the tempering coil there is also a by-pass, similar to the one under the main heater, fitted with a swinging damper controlled by a thermostat in the upper part of the plenum chamber. If the air in the plenum chamber becomes too hot, the thermostat opens the damper under the tempering coil, instead of through it. The air is admitted to each room at a point about 8 ft. above the floor.

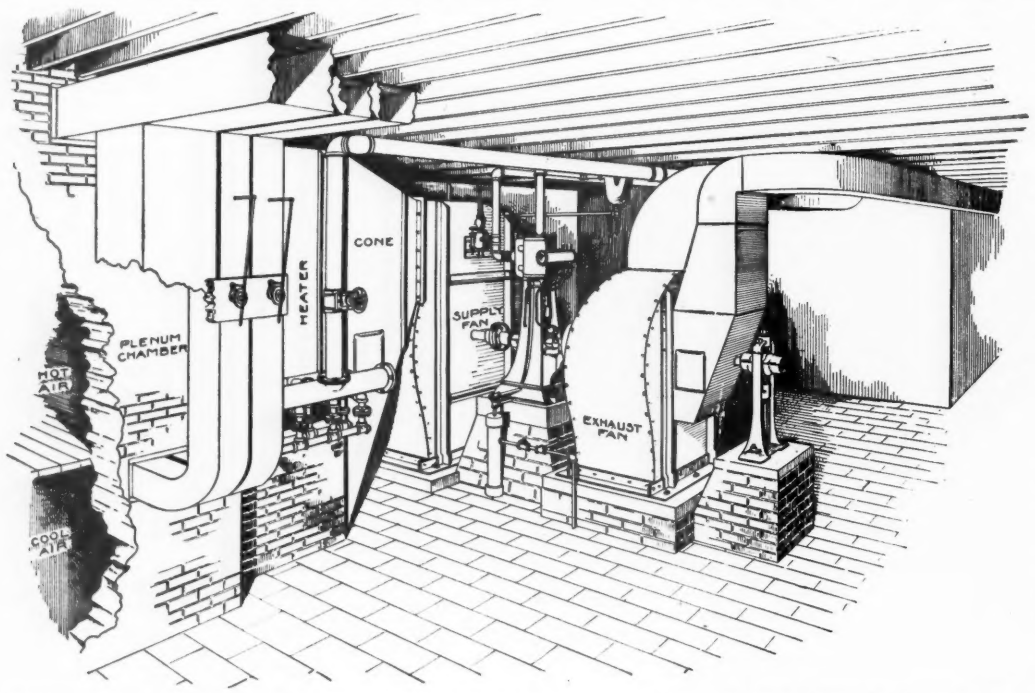
The fan is driven by a direct-connected vertical engine specially designed for this class of work. The exhaust fan is also direct-connected to this same engine, which therefore draws the impure air out of the building while discharging pure, warm air into it. This feature of mechanical ventilation is in general favor for public buildings.

In each office on the first floor there is an ornamental register face at the floor line, opening into the corridor, which extends through the center of office. The impure air is drawn down through a large register in the floor at the rear of the corridor and passes through the exhaust fan. The air from the drafting room and second story offices is drawn down through a flue at the side of the vault.

The condensation from the heating apparatus is returned to a Webster feed-water heater in the engine room of the factory, by means of the Webster vacuum system, which also handles all the condensation from two other heating plants located in the factory. The vacuum system relieves the factory engine of back pressure when the exhaust steam is used for heating, and also removes the air from the heating coils and connecting pipes as fast as it accumulates, making the heating surface more effective than it otherwise would be. The operation of the system involves practically no increased cost, as only steam that would otherwise be wasted is used, and without back pressure.



Plan of Basement—New Office Building of The American Blower Co., Detroit, Mich.



Sectional View of Heating and Ventilating Plant—New Office Building of the American Blower Co., Detroit, Mich.

TECHNICAL.

Manufacturing and Business.

The New Castle Forge & Bolt Company have begun work on a large addition to its shops at New Castle, Pa.

Geo. H. Gibson has resigned from the B. F. Sturtevant Co., to go to the International Steam Pump Co., 114-118 Liberty street, New York City.

An officer of the General Electric Company tells us that the General Incandescent Arc Light Company has been absorbed by the General Electric.

The O'Rourke Engineering Construction Company, large contractors for pneumatic and other foundation work, has moved its New York city offices to the corner of Nassau and Cedar streets.

Robert Poole & Son Company, Baltimore, Md., builders of machinery, has been incorporated as the Poole Engineering & Machine Co., with a capital of $350,000. Geo. Poole, Robert Poole Sampson and others are incorporators.

The Raleigh Foundry & Machine Mfg. Company has been incorporated in Delaware with a capital of $75,000. W. T. Hildrup, Thermal City, N. C.; J. G. Blain, Raleigh, N. C., and Reynolds Clough, Dover, Del., are incorporators.

The Merrill-Stevens Engineering Company, machinist and ship builder, Jacksonville, Fla., will change its name to the Merrill-Stevens Co., and has incorporated with a capital stock of $500,000. Arthur D. Stevens is President; Frederick Seeley, Secretary, and James E. Merrill, Treasurer. The company will enlarge its plant.

The Chicago Car & Locomotive Works, recently incorporated, will take over the Pease Car & Locomotive Works at Hegewisch, Ill. Additional machinery and equipment has been installed by the new company. L. H. Baldwin is President and Treasurer of the company, and E. Gaidzik, Secretary. Offices are at 609 Fisher building, Chicago.

The S. Obermayer Co., Cincinnati, Ohio, and Chicago, maker of foundry facings and equipments, has secured the contracts for the entire foundry equipment of the new technical school of the University of Chicago; also for the entire foundry equipment of the Crane School of Chicago. The contracts include complete outfits for both brass and iron foundries.

Thomas Chalmers, one of the founders of the firm of Fraser & Chalmers, constituent part of the Allis-Chalmers Company, died at Chicago on Monday last. Mr. Chalmers came to America from Scotland in 1843. He had a part in building Chicago's first water works, a single pump at the foot of the river; installed the first steam heating apparatus in the city, that in the old Dearborn school, and was one of the engineers of the old Illinois and Michigan Canal.

Iron and Steel.

The earnings of the United States Steel Corporation for the second quarter of the year were $36,499,528 as compared with $37,662,058 for the same quarter a year ago; a decrease for the three months of $1,162,530.

Gun Carriage Contracts.

The Ordnance Bureau of the War Department has let a contract to the Morgan Engineering Company, of Alliance, Ohio, for 15 gun carriages for disappearing 6-in. guns at $11,085 each, and a contract to the Rarig Engineering Company, of Columbus, Ohio, for 20 carriages for the same kind and calibre of guns for $9,450 each.

Pneumatic Tool Litigation.

On June 29, 1903, Judge Lacombe, United States Circuit Court for the Southern District of New York, denied the application of the Philadelphia Pneumatic Tool Co. to dissolve a preliminary injunction which went into effect April 6 last, and which prevented the Philadelphia Pneumatic Tool Co. from making, selling, or using a rotary drill declared to be an infringement of the Moffet patent controlled by the Chicago Pneumatic Tool Co. The infringement refers to the use of a feed screw covered by the second claim of the Moffet patent. The preliminary injunction as originally granted the Chicago Pneumatic Tool Co. covered four claims of the Moffet patent; but the United States Circuit Court of Appeals, on March 24, 1903, affirmed the order for preliminary injunction "as to the second claim only—and reversed as to the first, third and fourth claims."

American Machinery in Japan.

In a report sent from Kobe, Japan, United States Consul Lyon describes the exhibit of American machinery at Osaka Exhibition. F. W. Horne, of Yokohama, the Japanese agent for the companies represented, has charge of the display, which is in a separate building which covers 1,200 sq. ft. The building is fitted up as a modern machine shop and contains all sorts of machinery in working order, valued at $74,000. Among the companies represented are the Niles-Bement-Pond Co., Pratt & Whitney, Chicago Pneumatic Tool Co., Gisholt Machine Co., Rand Drill Co., Bradford & Sebastian, Buffalo Forge

Co., J. A. Fay & Egan, Laidlaw-Dunn-Gordon Co., Brown & Sharpe, H. W. Johns-Manville Co., William Sellers & Co., Norton Emery Wheel Co., and others. Each company has characteristic tools shown and many orders are being taken as a result of the exhibit.

Freight Tonnage Through the Soo Canals.

During the two months of April and May the total freight carried through the two canals at the Soo was 6,039,856 tons, which is 74,963 tons more than the quantity carried in April and May of 1902, and 4,591,811 tons more than recorded for the corresponding months of 1901. The quantity carried through the Canadian Canal was 796,510 tons against 532,188 tons in 1902 and 151,679 tons in April and May, 1901. During April and May, 1903, the Canadian Canal carried 11.64 per cent. of the total; in 1902, nearly 8 per cent., and in 1901, 6.8 per cent.

The quantity of wheat carried east by the two canals in April and May, 1903, was 15,347,173 bushels, a decrease of 3,414,000 bushels compared with the same period of 1902. There was also a decrease in flour of 217,390 barrels; in iron ore, of 434,048 tons; in lumber, of 16,345,000 ft. The chief increases were in grain other than wheat (2,970,864 bushels) and in general merchandise (5,111 tons).

Predetermination in Railroad Work.

To the steam engineer it must occasion some surprise to observe how closely the performance of an electric train can be predicted from the knowledge gained by a few stand tests on its motors. When the particulars of the problem are fully known, it is possible to determine how the motor will behave dynamically, when put to a particular service, with almost as great a degree of accuracy as its conduct can be observed. This possibility arises from the simplicity and definiteness of the circumstances on which the performance of the motor depend. At any particular voltage the torque and speed corresponding to a particular current are definite and can be determined from stand tests, whilst the change in these quantities with variation of voltage can be computed. The relation between torque and speed is all that one need know about the motor in order to determine its dynamical effect on the train. Knowing the frictional resistance to motion at any particular speed, we can, from the torque and mass moved, determine the rate of change of speed, and hence the interval of time required to produce a given small change in speed, and so, by a process of point to point construction, obtain the speed-time curve, from which to determine the times, distances, etc., which are the ultimate ends of the calculation. Though somewhat long and tedious, this is the natural and sagacious method of attacking the problem. It is the method of the pioneer, which is applicable to any speed-torque curve.—*Extract from a paper by Mr. F. W. Carter, presented to the American Institute of Electrical Engineers, June, 1903.*

Piece Work in the Norfolk & Western Shops.

The machinists demanded the abolition of the piece price system and were persuaded to submit the question to arbitration. The "Third Arbitrator," Mr. Alexander Delaney, decides in favor of the present system, for the following reasons:

In reviewing the evidence as reported in the minutes, it does not appear that the machinists employed in the piece work system in the shops of the Norfolk & Western Railway Company complain of any unfair treatment on the part of the management which has controlled the affairs of the company during the last six years, nor has there been any request for a change of rates during this period. There have been no cuts in rates with the exception of three cases, one of them being an advance, the other two being a reduction mutually agreed upon by the parties interested, due to better facilities provided by the company, more efficient tools and better steel, thereby increasing the output of work in a stated time. During this period of six years the men had the advantage of continuous work, and have earned wages considerably in excess of the average day rate—men working by piece work rates, have earned from 31 to 41 cents an hour, or an average of 36 cents an hour. The capacity of the machines, and the rates per hour, indicate that the earnings of the workmen might be further increased if the contingencies of the business at times should require a greater output than the average. This, however, would be optional on the part of the men—they being the best judges of their physical endurance.

I am free to say, that in my opinion the piece work system as practiced in the shops of the Norfolk & Western is not objectionable in that feature which enables a capable and industrious mechanic, if he so wills, acting as an independent individual, to make an agreement with his employer, on such terms as may be agreed upon, which will give him an opportunity to increase his income, advance his position in life and conduce to the benefit of his family.

Canadian Westinghouse Company.

The Canadian Westinghouse Company has been incorporated in Canada, with headquarters in Hamilton. Among those interested are George Westinghouse, Pittsburg; Henry Herman Westinghouse, New York; George Carson Smith, Frank Hendrickson Taylor and Loyall Allen Osborne, Pittsburg; Thomas Ahearn and Warren Young Soper, Ottawa, and Paul Judson Myler, Hamilton.

Hot-Blast Dry Kiln for the H. C. Dexter Chair Company.

The new "hot-blast" dry kiln at the plant of the H. C. Dexter Chair Co., of Black River, N. Y., draws air from out-of-doors and passes it into the fan house, thence through the heater wherein it is heated to any desired temperature. By means of the fan it is positively forced into the kiln, where it comes in contact with the lumber and, because of its high temperature and dryness, rapidly absorbs the moisture. It is then discharged to the atmosphere, or, if advisable, some of the warm air may be returned to the heater, thus regulating the degree of humidity in the kiln and preventing the too rapid drying of the exterior of the stock. With this "hot-blast" system far less steam pipe is required than by any system of direct heating and it is all massed in a fireproof casing close to the fan. The circulation of the air is independent of the weather and the ample space in the heater and the equal distribution of the air through the ducts beneath the kiln secure better and more readily controllable results than can be obtained in any other way. In the progressive kiln arrangement, the lumber is placed upon cars which are run into the kiln upon two tracks. Two or more cars are added each day, all being slowly passed through against a constant current of warm air. In this way the lumber is subjected to an even draft of hot air constantly increasing in temperature and dryness as the cars gradually advance towards the hot end of the kiln. The difference in temperature between the two ends of the kiln varies in practice from 50 to 100 deg. F. The kiln is provided with curtains at the top, bottom and sides, arranged to fit closely the lumber on the cars so that the hot air will be forced through the lumber. The apparatus at the Dexter mill consists of a steel-plate exhauster, direct-driven by a steam engine and drawing air through a steam-pipe heater, also 200 ft. of 12 lb. rail, and 24 roller-bearing steel truck frames. An air condenser is interposed in the return duct through which the air is passed on its way from the kiln to the fan. This removes a large part of the moisture from the air and at the same time allows much of the heat to be recovered, thus affecting a saving of steam. This kiln was designed and built by the B. F. Sturtevant Co., Boston, Mass.

THE SCRAP HEAP.

Notes.

The Union Pacific is now using wooden hoops to deliver train orders (form 19) to trains in motion.

Newspaper reports say that the losses of the Pennsylvania Railroad by the flood at Jeannette, Pa., July 5, amounted to $500,000. About 1,000 men had to be assembled to restore the roadbed, bridges and tracks.

According to a Pittsburg paper the extensive introduction of the manual block system has caused in that region a pronounced shortage of telegraph operators.

The Chicago & North Western has ordered all of its freight cars to be painted a uniform red color. Heretofore different colors have been used for different classes of cars.

On the Pennsylvania Lines West of Pittsburg the uniform rate of a dollar a meal has been abandoned on some of the dining car lines and the experiment is being tried of serving meals by the card.

The State Railroad Commission of Mississippi has been enjoined by a perpetual injunction, issued by the United States Court, restraining it from compelling the Illinois Central to stop certain limited passenger trains at Magnolia.

The Southern Pacific has appointed a Japanese land and immigration agent, Mr. K. Isomoto. Mr. Isomoto's duty will be to encourage Japanese investors and rice farmers to purchase lands and settle in the Gulf coast country of Louisiana and Texas. His headquarters will be at Kobe, Japan.

Chicago papers report that conductors and brakemen of the Illinois Central have obtained an increase in wages; freight conductors north of the Ohio River 15 per cent., and south of the same line 12 per cent.; passenger conductors 12 per cent. north of the Ohio and 9 per cent. south of it.

Texas papers say that the Southern Pacific is to provide extensive facilities at Galveston to enable it to ship live stock to foreign countries from that port instead of sending it by way of New Orleans. It is expected that within a few months 40,000 Texas steers will be sent from Galveston to South Africa.

The Michigan Central is to use the telegraphone; the arrangement, heretofore described, of a telephone, on a wrecking car or other special train, with facilities for quickly connecting with the train despatcher's office over the telegraph wires. The telegraph wires have been prepared for this service between Detroit and St. Thomas (111 miles), and also between Chicago and Michigan City.

The State Railroad Commission of Texas has notified the express companies of the State that, in making a recent advance in tariffs, the companies have violated the law; they should have first secured the approval of the commission. The companies are warned that unless the former tariffs are at once restored, the commission will proceed to adopt and promulgate such schedules as it may see fit.

The State Railroad Commissioners of Alabama have refused to grant the demands of shippers who desire to have the rates for the transportation of freight in their State reduced to the basis prevailing in Georgia. The commissioners say that on traffic which is carried wholly within the State of Alabama the railroads do not earn more than 2 per cent. on their capital, and even including interstate business only two roads earn as much as 6 per cent.

The magnitude of the work of clearing up after the flood at Kansas City is partly indicated by the statement that the Atchison, Topeka & Santa Fe had to take 440 cars of merchandise to Florence, Kan., for the purpose of getting out and assorting their contents and cleaning up such articles as were susceptible of salvage in that way. It is said that the railroads will resist the payment of claims for losses due to the flood except in cases where it appears that the company was negligent.

The New York, New Haven & Hartford recently notified its western connections, from which it receives coal at New York city, that it would no longer accept shipments at the joint rates which have been in force for a long time. This announcement, made last week, was followed by another saying that the western connections were indifferent to this action; but later it was reported that officers of the New Haven had conferred with those of the Pennsylvania, the Lehigh Valley, the Reading and the Central of New Jersey, and that revised through rates would at once be made up. It appears to be understood that under the new tariff the New Haven will have an increased percentage of the through rate.

A press despatch from Chicago says that express agents of that city have announced increases in rates on shipments of merchandise in packages weighing less than 50 lbs. Where the rate has been 25 cents it will be 30 cents, and the 30 cent rate is increased to 35, and so on. Printed matter has been increased about 10 per cent. In Massachusetts, the American and the Adams express companies are now competing between cities where heretofore they have refrained from competition. Between New York and Springfield, for example, the Adams, having the shortest line, has heretofore done all of the business, but now the American is in the field. Between Springfield and Boston the American has the shortest line, but the Adams is now bidding for business.

Buenos Ayres Railroads.

The *Buenos Ayres Weekly Herald*, of May 8, gives the following facts about the railroads in Argentina: During the past year 241 miles of new railroad were built, making a total of 11,181 miles now in operation in the republic. Gross earnings were, approximately, $42,489,000, and net earnings, approximately, $20,000,000. A petition is now before Congress for the consolidation of the Central Argentine and the Rosario railroads.

Brazilian Railroads.

According to reports from the *South American Journal*, Brazil had 9,375 miles of railroad on Jan. 1, 1903. Of the 20 States which comprise this republic, only five are without railroad facilities. Of the 15 States with railroads, San Paulo has 2,259 miles; Minas, 2,250 miles; Rio de Janeiro, 1,314 miles, and Rio Grande do Sul, 1,000 miles. All of these States are situated on the southern coast of Brazil; the northern portion of the country is practically devoid of railroads.

Fifty-two Fatalities on the Fourth.

According to the Chicago *Tribune*, returns collected from 200 cities show that 52 persons were killed and 3,665 injured in the patriotic demonstrations of the Fourth of July. The loss of property by fire amounted to $400,625. The toy pistol injured 559 persons; gunpowder in home-made bombs and fireworks claims 768 victims. Firearms, carelessly handled, injured 562 persons. Skyrockets caused 206 injuries, cannon 319, and runaways 81; and fireworks unclassified 1,170. These figures, along with those about the multitudes of people in London who are killed by falling out of windows, may be recalled by railroad men as a corrective, whenever the railroad-accident record causes despondency.

American Locomotives in Bavaria.

Mr. James H. Worman, Consul General at Munich, learns from the officers of the Bavarian State railroads that the locomotives which had been bought in order to study the American system of locomotive building have proved, because of their simplicity, their originality of construction, and their remarkable adaptability for fast and freight trains, most acceptable, especially as to durability and efficiency; and that up to this time nothing has been discovered to warrant a statement that, with the same care bestowed upon them as upon the Bavarian locomotives, the American locomotives would prove less durable than those built in Europe. Indeed many of the parts of construction have been found so simple and practical that they will be adopted in the construction of Bavarian locomotives.

300 Miles Without a Stop.

It appears from the English papers that on the fast run which was made by the London & North Western from London to Carlisle, June 19, without a stop (*Railroad Gazette*, July 3, p. 500) there were two engines. It was not deemed prudent to try to keep the fire of a single engine in sufficiently good condition to make this hard run of 299.25 miles without relief. There is a grade of 70 ft. per mile not far from London and another long steep grade near the end of the route. This train was a special, made up of 10 dining cars and two brake vans. It carried 200 passengers, delegates to the International Telegraph Convention at Glasgow. It weighed about 450 gross tons, behind the tender, and the average speed was over 50 miles an hour. The run without a stop, from Jersey City to Pittsburg, 440 miles, over the Pennsyl-

vania road, in June, 1876, was made with one engine, but there were only three cars. The speed was about 44 miles an hour.

A Record Run on the Great Western of England.

Press despatches from London July 14 say that on that day a train was run over the Great Western Railway from London to Plymouth, 246 miles, in 233 min. 45 sec. This represents an average rate of 63.10 miles an hour. The despatches say that this makes a world's record. Considering speed alone this statement is incorrect, as the special train that was run from Chicago to Buffalo, Oct. 24, 1895, made 510.1 miles at 63.61 miles an hour. Possibly the Great Western train was heavier than that of the Lake Shore; but there would still remain the difference in total distance. The Lake Shore train consisted of three cars weighing 304,500 lbs. The train, including the engine, weighed about 488,000 lbs.

A Railroad Institute.

The Indianapolis Railroad School and Technical Institute is the name of an establishment which, according to the newspapers, will be set a-going in Indianapolis next month. It is said to be incorporated with a capital of $10,000; and the incorporators are J. R. Buckley, President; C. S. Rhoads, Secretary; Hugh S. Curley, John M. Lindley, C. M. Dickson, Thomas Kelly, M. W. Mansfield, A. A. Zion and C. A. Paquette. Mr. Rhoads is Superintendent of Telegraph of the Cleveland, Cincinnati, Chicago & St. Louis; Mr. Dickson is Train Master of the Indianapolis Union; Mr. Mansfield is Superintendent on the Pennsylvania Lines West of Pittsburg; Mr. Zion is Superintendent of the Indianapolis Union Railway, and Mr. Paquette is Superintendent of the Chicago and the White Water Divisions of the C., C., C. & St. L.

It is said that there will be 25 instructors in the Institute, and that the locomotive, its construction and management, train running, and all departments of railroad work will be made subjects of instruction.

B. & O. Cipher Code.

The telegraph cipher code which has been issued by the Baltimore & Ohio makes a pocket book of 57 pages. Codes are provided for different departments, as follows: 1, general correspondence; 2, addresses, appointments and engagements; 3, reports and requests; 4, special passenger arrangements; 5, special trains and cars on trains; 6, cars (distribution, movement and storage); 7, cars (tracing and location); 8, cars (repairs and light weighing); 9, freight astray; 10, freight (change of consignment and route); 11, freight (movement); 12, freight (regulation of shipments); 13, freight (confiscation of coal); 14, freight (tracing, billing, disposal and rates); 15, freight (transfer of lading); 16, freight (weighing); 17, motive power. Following these short codes is a general code including all the others. Each code word begins with the same letter as the phrase which it represents, so that cross references are not necessary. "The object of the code is brevity, not secrecy," and it is to be used as far as practicable in general telegraphic correspondence.

Locomotive Building in France.

At a recent general meeting of the French Mechanical Construction Company (formerly the Cail Works) the president, Mr. Le Chatelier, made the following statement in reply to questions from stockholders.

Recently in tendering for locomotives in Spain we found ourselves in competition with German builders who had lowered their prices to a point apparently below cost, though they were receiving orders from their own government at prices better than we can obtain for similar work in France. This condition of affairs is difficult to meet. Our export business, however, is only a small fraction of our production. The number of locomotives ordered each year by the French railroads varies greatly. In some years orders have been placed amounting to several times the maximum production of the French locomotive works, and locomotives have been ordered abroad: in Austria in Belgium and even in America. Orders were placed in America chiefly for the purpose of securing for comparison examples of American construction. These locomotives have certain good points of design, but they show a carelessness in construction to which we are not accustomed.

At the present time our works at Denain are not only among the best equipped in France, but are equal to the best in Europe. The cost of production has been reduced more than I dared to hope. During the past 15 months very few locomotive orders have been placed. The question has arisen as to whether it is not better to take orders for locomotives at a very low figure rather than not to take any at all. We decided in the affirmative and have lowered our prices sufficiently to secure orders. We have secured nearly all the orders given out during the past 15 months and have brought our prices to a point which a year ago was entirely unforeseen. This decrease in prices has surprised everyone, and while securing us the most flattering comments has given a satisfactory margin of profit.

A Large Irrigation Project.

An important irrigation work for the reclamation of arid lands is under way in the valley of the Snake River in Cassia and Lincoln Counties, Idaho, at and near the town of Milner, and known as the Twin Falls canal. The waters of the Snake River will be raised by a dam at Milner and through 100 miles of main canal and 1,000 miles of lateral canals will spread over 700 sq. miles of arid land, and 248,000 acres of land will ultimately be irrigated by the system. The dam will be 900 ft. long and 64 ft. high, and will be built in three sections connecting small islands in the river at that point. The canal on the south side of the river will be 65 miles long, 90 ft. wide on the bottom at its head, and gradually narrowing to 15 ft. at the lower end, and 9 ft. deep. It will have a grade of 1 ft. in 5,000. The canal on the north side will be 20 miles long, 25 ft. wide at the bottom at the head, gradually narrowing to 10 ft. at the lower end. It will have a grade of 2 ft. to the mile and carry 5.5 ft. of water at the head. Construction work on the main canal was begun some months ago and sub-contractors are working at intervals of one mile. The cost of the dam, canals and lateral system will be $1,500,000. The first opening of the lands under the system was set for July 1, when 60,000 acres were offered for sale, not more than 160 acres to any one person, at a uniform price of 50 cents an acre, 25 cents on application and the rest any time after one year's residence on the land, of which the settler must cultivate $^1/_{16}$ part the first and $^1/_{16}$ more the second year. No tax is charged except for water actually used. Beside the payment to the State a water right must be bought from the canal company at $25 an acre, $3 an acre cash on making contract and other payments over a period of seven years. When this $25 is paid the buyer owns, beside his land, a perpetual water right; and after one-half the amount is paid the settlers have complete control of the water canal. It is estimated that when the Twin Falls canal is completed it will mean a total increase in farm wealth of $22,671,200, and a total increase in population of 51,000, at a cost of $1,500,000 for the irrigation system.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

National Railroad Master Blacksmiths' Association.

The next meeting will be held in Buffalo, N. Y., on Aug. 18, 19 and 20. Headquarters will be at the Genesee Hotel. A. L. Woodworth, Secretary, Lima, Ohio.

American R. E. & M. W. Association.

Mr. W. C. Cushing, Pennsylvania Lines, Pittsburg, of the committee on signaling and interlocking of the American Railway Engineering and Maintenance of Way Association, sends out a circular asking for information on manually operated block signals. Taking (1) the simple block system and (2) the controlled manual, he asks, for each, the number of miles of road, number of signals, a typical diagram of a block section and a drawing of a signal with its operating mechanism. Copies of the code of rules and of specifications for construction are also asked for. In connection with controlled manual the circular asks about the electric slot on the home and the advance signal and (if this is used) how the distant signal is controlled. The overlap, if used, and the length of track circuits, should be reported on.

PERSONAL.

—Mr. C. S. Evans, Assistant Superintendent of the Western & Atlantic, died at his home in Atlanta, Ga., on July 8.

—Mr. Frederick Abbot, at one time Vice-President and Assistant Treasurer of the Wisconsin Central and for a number of years Comptroller, died suddenly in Milwaukee, on July 8.

—Owing to ill health Mr. F. W. Webb, Chief Mechanical Engineer of the London & North Western, has already handed over his duties to his successor, Mr. Whale; somewhat sooner than had been expected.

—Mr. S. F. B. Morse, late Assistant Passenger Traffic Manager of the Southern Pacific Company, is now a banker in New York, having formed a partnership with Mr. D. J. Sully under the title of D. J. Sully & Co.

—Mr. John W. Sanborn, Superintendent of the Northern Division of the Boston & Maine, died at Sanbornville, N. H., July 9, at the age of 81. Mr. Sanborn was born in Wakefield, N. H., and has been in railroad service since 1874, when he began as general agent of the Eastern Railroad. The next year (1875) he was made Superintendent of this road, and in 1884 became Superintendent of the Northern Division of the Boston & Maine.

—Hon. Andrew G. Blair, for the last seven years Minister of Railways and Canals of Canada, has handed to the Prime Minister his resignation. According to the press despatches it appears that the resignation has already been accepted. Mr. Blair is opposed to the building of a new railroad from Moncton to Quebec: holding that the present Intercolonial line should be used for the eastern connection of the proposed new transcontinental railroad.

—Mr. T. A. Mackinnon, First Vice-President and General Manager of the Boston & Maine, died at Marblehead Neck, Mass., on Sunday last, at the age of 59. He was stricken with heart disease in his office in Boston on Friday. Mr. Mackinnon was born in Ireland and began his railroad service on the Passumpsic road in 1868. He was Superintendent and Manager of the Brockville & Ottawa, the Southeastern and other Canadian roads, and about 1887 went to the Canadian Pacific. He was soon made Manager of Transportation of the whole Canadian Pacific System, but in 1890 he left to become General Manager of the Concord & Montreal. This road soon became a part of the Boston & Maine, and in 1894 Mr. Mackinnon was made General Manager of the latter road.

—Mr. James M. Waldron, late of the New York Central, has been appointed Signal Engineer of the Rapid Transit Subway Construction Company, New York city, the company which is to operate the underground railroad. The contract for the elaborate signaling installations required for this road has been given to the Union Switch & Signal Company. Mr. Waldron was born in 1866 at Milton, Pa., and was graduated in civil engineering at the Pennsylvania State College in 1889. The next two years he worked for the Chattanooga Southern on location and construction, and in 1892 went to the Union Switch & Signal Company. After five years there he went to the Boston Elevated; and in 1899 resigned his position there to go to the Diamond State Steel Works, where he built the electric plant and afterward took charge of it. From this place he went to the New York Central as Supervisor of Signals at Albany.

—Mr. Charles C. Martin, Consulting Engineer of the Department of Bridges of New York city, died on July 11, at the home of his son at Far Rockaway. Mr. Martin's death was due to apoplexy. He was born in Springfield, Pa., in 1831, and was graduated from Rensselaer Polytechnic Institute at Troy, N. Y., as a civil engineer in 1856. After spending a year in the institution as an instructor he went to Brooklyn as rodman in the engineering department of the city water works. He left there to become Assistant Engineer of the Trenton Locomotive Manufacturing Company. Mr. Martin was one of the best known citizens of Brooklyn and took a prominent part in laying out Prospect Park in that city. His best known work, however, has been in connection with the New York and Brooklyn Bridge. He was associated with Mr. Roebling in its construction, and when the structure was finished, in 1883, was appointed Chief Engineer. He held this position through successive administrations, until January, 1902. Mr. Lindenthal, who became head of department of bridges at that time, put Mr. Martin in a comparatively inactive position, that of Consulting Engineer.

—Mr. J. J. Frey, who for a number of years was General Manager of the Atchison, Topeka & Santa Fe, and later President of the Florence & Cripple Creek, died last Monday after a long illness. Mr. Frey was born in Jeffersonville, Ind., in 1848. At the age of 17 he entered the service of the Ohio & Mississippi as a messenger boy, and in 1868 went to the Missouri Pacific as Train Despatcher. From 1872 to 1874 he was Trainmaster and Superintendent of Telegraph of the Missouri, Kansas & Texas, and for the two years following was Superintendent of the Sedalia & Missouri Division of the same road. In May, 1876, he went to the St. Louis, Iron Mountain & Southern in a similar capacity, and in 1882 became Assistant Superintendent of the entire line of that company. In 1884 Mr. Frey was appointed General Superintendent of the Texas & St. Louis, but resigned shortly to go back to the Missouri, Kansas & Texas as Division Superintendent. In 1888 he was made General Superintendent of the M., K. & T. For a few months in 1893 he was Vice-President and General Manager of the East Line & Red River, but in the same year he was appointed General Manager of the Atchison, and remained there until his election to the presidency of the Florence & Cripple Creek in 1900.

—Mr. Pulaski Leeds, Superintendent of Machinery of the Louisville & Nashville, whose death, at the hands of a murderous discharged employee, was announced last week, was about 58 years old. He was born in Darien, Conn., and had been in railroad service since early boyhood. He began as a machinist apprentice on the New York & New Haven, where he remained until 1877, when he resigned to become Superintendent of Motive Power of the Boston & New York Air Line. After two years here he took a similar position on the Indianapolis, Decatur & Springfield. In 1882 he resigned from the I., D. & S. to go to the Louisville & Nashville as Master Mechanic. He was promoted to be Superintendent of Machinery in 1889. Mr. Leeds was a man of strong character, combined with great kindness of heart; so that he had a wide circle of warm friends. His manners were sometimes blunt, but this was an element in his strength and he was an able executive officer. His management of his department in connection with the requirements of the Federal laws concerning air-brakes and automatic couplers was recently commended by the Secretary of the Interstate Commerce Commission as the best in the country. Mr. Leeds was president of the Master Mechanics' Association in 1897, and has been for years a prominent member both of this and the Master Car Builders' Associations.

ELECTIONS AND APPOINTMENTS.

Berlin Branch.—The officers of this company are: President, W. A. Himes; Vice-President, W. G. Leas; Secretary and Auditor, C. J. Delone, and Treasurer, J. Keith.

The Berlin Branch is a part of the Western Maryland System running from Berlin Junction to East Berlin, Pa., seven miles.

Chicago, Burlington & Quincy.—J. N. Redfern has been appointed Superintendent of the Relief Department, with office at Chicago.

Chicago Great Western.—G. H. Herold has been appointed Division Engineer, with headquarters at Red Wing, Minn., succeeding C. P. Cogswell, Jr., resigned.

Chicago, Rock Island & Pacific.—W. J. Lawrence, hitherto Superintendent of the Dakota Division, has been appointed Superintendent of the Cedar Rapids Division, with headquarters at Cedar Rapids, Iowa.

Cooperstown & Charlotte Valley.—D. E. Siver, President; James W. Tucker, Vice-President, and Mrs. F. E. Whitbeck, Secretary and Auditor, having resigned, the following were, on July 7, elected: David Willcox, President, New York city; Abel I. Culver, Vice-President, Albany, N. Y., and F. M. Olyphant, Secretary and Treasurer, New York city. These officers are officers of the Delaware & Hudson, which company operates the C. & C. V.

Delaware & Hudson.—See Cooperstown & Charlotte Valley.

Denver & Rio Grande.—D. Hardy, Superintendent of the First Division, with headquarters at Pueblo, Colo., has resigned.

East Broad Top.—R. S. Seibert has been appointed General Manager.

Erie.—C. C. Riley, heretofore Car Service Agent of the Chicago Great Western, has been appointed Superintendent of Car Service of the Erie, with office at Jersey City, N. J.

T. H. Pindell, Superintendent of the Susquehanna and Tioga Divisions at Elmira, N. Y., has resigned. (See Lehigh Valley.)

Jacksonville & Southwestern.—The officers of this company are: President, Charles W. Chase; Vice-President, L. W. Chase; Secretary and General Manager, Edward S. Spencer; Treasurer, H. F. Dutton, Jr.; Auditor and Cashier, M. H. Haughton; General Counsel, E. J. L'Engle; Master Mechanic, J. J. Whitaker; Trainmaster, A. R. Chappell, and Roadmaster, J. R. Thrope.

Houston & Texas Central.—The shops of this company have been consolidated with those of the Houston East & West Texas, and the jurisdiction of S. R. Tuggle, Superintendent of Motive Power and Machinery, has been extended over the H., E. & W. T. The office of Master Mechanic of this latter company has been abolished and S. Millican has been assigned to other duties.

Lehigh Valley.—John T. Keith has been appointed Superintendent of the Buffalo Division, and the Lake Lines of the Lehigh Valley Transportation Company, succeeding L. H. Van Allen, resigned. Thomas H. Pindell, heretofore Division Superintendent of the Erie, has been appointed Superintendent of the Wyoming Division of the L. V., with office at Wilkesbarre, Pa., succeeding Mr. Keith.

Louisville & Nashville.—H. Walters, Chairman of the Board of the Atlantic Coast Line, has been elected Chairman of the Board of the L. & N., succeeding August Belmont.

Michigan Central.—Richard H. L'Hommedieu, General Superintendent, has been appointed General Manager. S. P. Hutchinson, Assistant General Superintendent, succeeds Mr. L'Hommedieu as General Superintendent, and the office of assistant has been abolished.

Mobile, Jackson & Kansas City.—The following officers have been appointed: President, W. D. Stratton; Vice-President, W. A. Stanton, and P. C. Butler, Secretary.

New York, New Haven & Hartford.—A. S. May has been elected Treasurer, with office at New Haven, succeeding the late W. L. Squire. T. F. Paradise was appointed Assistant Treasurer. N. E. Smith, Chief Train Despatcher at New Haven, has been appointed Superintendent of Telegraph, with office in that city. This is a new position recently created.

Norfolk & Western.—T. S. Davant has been appointed Freight Traffic Manager and will be succeeded by R. J. Ruffin as General Freight Agent, effective July 15. Both with headquarters at Roanoke. Mr. Ruffin was formerly Division Freight Agent at Columbus.

Philadelphia & Reading.—George Ziegler, heretofore Auditor of Traffic Receipts, has been appointed Assistant Comptroller, with office at Philadelphia, Pa.

St. Louis & San Francisco.—H. M. Fickinger, Superintendent, with headquarters at Memphis, has resigned.

St. Paul Union Depot.—W. F. McMillan, Superintendent and Purchasing Agent, has resigned, effective July 20.

San Antonio & Aransas Pass.—Charles R. Hudson has been elected President of the S. A. & A. P., succeeding W. D. Cornish, resigned.

Seaboard Air Line.—D. E. Maxwell, heretofore Superintendent of the Sixth Division, has been appointed General Agent, with office at Jacksonville, Fla.

Virginia & Southwestern.—W. E. Allen has been appointed General Freight and Passenger Agent. The office of Traffic Agent, hitherto held by Mr. Allen, has been abolished. Guy Darst, heretofore Assistant Traffic Agent, has been appointed Assistant General Freight and Passenger Agent.

LOCOMOTIVE BUILDING.

The Pennsylvania is having 50 locomotives built at the Baldwin Works.

The Baltimore & Ohio is having 15 locomotives built at the Baldwin Works.

The Minnesota & International has ordered three locomotives from the American Locomotive Company.

The Kansas City, Mexico & Orient is having three locomotives built at the Manchester Works of the American Locomotive Co.

The Terminal R. R. Association of St. Louis, as reported in our issue of July 10, has ordered 15 simple switching locomotives from the Baldwin Works for July, 1903, delivery. The total weight on drivers is 135,000 lbs.; cylinders, 20 in. x 26 in.; diameter of drivers, 51 in.; working steam pressure, 200 lbs.; tank capacity, 5,000 gal. of water, and coal capacity, six tons. Special equipment includes Westinghouse air-brakes and Baldwin boiler lagging.

CAR BUILDING.

The Chicago, Indianapolis & Louisville has ordered 200 cars from Haskell & Barker.

The Dayton, Lebanon & Cincinnati has ordered three coaches from Barney & Smith.

Wonham & Magor have ordered 20 third-class coaches from the American Car & Foundry Co.

The Susquehanna & New York has ordered 50 flat cars from the American Car & Foundry Co.

The Santa Fe Land Improvement Co. has ordered 30 dump cars from the American Car & Foundry Co.

The United Verde & Pacific is reported in the market for 20 narrow-gage flat cars of 50,000 lbs. capacity.

The Jacksonville & Southwestern is having 40 freights built at the Georgia Car & Mfg. Co., Savannah, Ga.

The Intercolonial has ordered 300 box cars of 80,000 lbs. capacity from Rhodes, Curry & Co., Amherst, N. S.

The Mansfield Coal & Coke Co. is having 100 freight cars built at the Terre Haute Works of the American Car & Foundry Co.

The Denver & Rio Grande has ordered 750 box, 350 stock, 400 coal and 200 national coal dump cars from the American Car & Foundry Co.

The Atchison, Topeka & Santa Fe is not having any cars built at the Mt. Vernon Car Mfg. Co. This was incorrectly stated in our issue of July 10.

The Chesapeake & Ohio, as reported in our issue of May 15, has ordered 20 side dump ballast cars of 60,000 lbs. capacity, from the American Car & Foundry Co. These cars will be 35 ft. 10 in. long, 8 ft. wide over sills, and 4 ft. 6½ in. high from sill to top of side, with wooden frames and underframes. Special equipment includes 4¼ in. x 18 in. iron axles, wood-trussed body bolsters, iron and wood composite truck bolsters, Diamond inside-hung brake-beams, Corning brake-shoes, Westinghouse brakes, poplar dust guards, gray iron journal boxes, pressed steel journal box lids, rigid arch bar trucks, and American Car & Foundry Co.'s wheels.

The Mexican Central, as reported in our issue of June 26, is in the market for five baggage cars and six first-class coaches. The baggage cars will be 60 ft. long, 9 ft. 6 in. wide over end sills, and 14 ft. 1 in. high from sill to top of roof, with wooden frames and underframes. The coaches will be 59 ft. 1 in. long, 9 ft. 8 in. wide over sills, and 14 ft. high from sill to roof, with wooden frames and underframes. Special equipment for both includes double hammered wrought iron axles, National hollow brake-beams, Westinghouse brakes and draft rigging, National Miller combination couplers, Soule dust guards, Hewitt journal box lids, Pintsch gas, Valentine's paint, four-wheel trucks and Spear heating system on the baggage cars, and six-wheel trucks, and Baker heating system on the coaches. Special equipment on the coaches also includes Pullman standard wide vestibules, Standard steel platforms, Mexican Central standard mixture brasses and Pantasote curtain materials.

BRIDGE BUILDING.

AMITE CITY, LA.—The Police Jury is asking bids on two bridges to be built over the Tangipahoe.

BATH, PA.—The County Commissioners will invite bids for a new bridge over Monocacy Creek at this place.

BOSTON, MASS.—The three bids for the spans of the Atlantic avenue bridge were rejected by the City Engineer as not conforming to specifications. They were from $150,500 to $170,000.

An officer of the Boston Elevated Ry. says that the Cottage Farm bridge cannot be built until authorized by the Legislature.

BUCTOUCHE, N. B.—The Chief Commissioner of Public Works, Fredericton, N. B., will receive bids to Aug. 13 for one through fixed truss span 95 ft. and one through swing draw span 280 ft. for a bridge over the river at Buctouche, N. B.

CAMDEN, N. J.—The Board of Freeholders has decided to build a bridge over Cooper's Creek, at Stoy's Landing.

CINCINNATI, OHIO.—Bids will be received until July 25, by Eugene L. Lewis, County Auditor, for bridges, drains and approaches on Johnson road.

Bids are wanted Aug. 1, by the County Commissioners, for a bridge over Taylor Creek, on Sheed road, Green Township.

CLEVELAND, OHIO.—The Board of Public Service has recommended the construction of a bridge over Doan Brook at Doan street.

COLUMBUS, OHIO.—Bids are wanted July 30, by the County Auditor, for approaches, substructures and superstructures on 14 bridges in Franklin County.

DAYTON, OHIO.—A concrete bridge is proposed at Third street.

DES MOINES, IOWA.—The plan to change the course of the Des Moines and Raccoon rivers, includes rebuilding a number of bridges. The matter is being considered by the City Council.

Reports state that the Belt Line bridge over the Des Moines River will be widened, at a cost of $28,000.

DULUTH, MINN.—Bids are wanted Aug. 3, by the Duluth Ferry Bridge Commission at the Mayor's office for a suspended car transfer or ferry bridge over the ship canal, to cost $100,000 or less.

FREDERICK, MD.—The Board of County Commissioners have agreed upon plans for four iron bridges each from 92 ft. to 125 ft. long, in Frederick County, to replace those washed away by recent floods.

GREENSBURG, PA.—It is reported that every bridge from East Greensburg to Youngwood has been washed away. The County Commissioners estimate a loss of $100,000 by recent floods to bridges and buildings.

HARTFORD, CONN.—The contract for building the stone bridge across the Connecticut River, at Hartford, was let July 13 by the Board of Commissioners to McMullen, Weand & McDermott, Park Row Building, New York city, for $1,369,520.

JANESVILLE, WIS.—Bids are wanted Aug. 8, by A. E. Badger, City Clerk, for a 228-ft. steel bridge over Rock River.

KANSAS CITY, KAN.—Bids are wanted until Aug. 3 for building a bridge across the Kansas River at Bonner Springs, and another near Turner, Kan. Address Frank M. Holcomb, County Clerk.

LOS ANGELES, CAL.—Bids are wanted July 21, by the Board of Supervisors, for building a bridge over Falling Creek, of thirteen 50-ft. spans, the bridge to rest on concrete foundations.

LYNCHBURG, VA.—Reports are that the Chesapeake & Ohio will spend about $75,000 in betterments, which include building a bridge over Blackwater Creek.

MANSFIELD, OHIO.—The Board of Public Service will soon want bids for a double arch bridge over Toby's Run at Bowman street.

MEMPHIS, TENN.—It is reported that the Illinois Central will replace all remaining wooden bridges between this place and Louisville, Ky., with steel bridges at about $1,000,000.

MILFORD, DEL.—It is reported that plans for a new bridge over the Mispillon River at this place are finished and the matter is now before the Levy courts.

NEVADA, MO.—The County Court will build three bridges—one at Eldorado over Clear Creek; one at Hacker Ford over Sac River, and one over Alder River at the Liston Ford.

NILES, OHIO.—Bids may be wanted for a bridge at Federal street. It is reported the Robbins avenue bridge may not be built.

NORMAN, OKLA. T.—The Norman Commercial Club wants information regarding a 678-ft. iron bridge to be built over South Canadian River. Address L. J. Edwards at this place.

PITTSBURG, PA.—The Governor has been asked to grant charters to build three bridges—one across the Ohio River at Osgood, one at Leetsdale, and one at Sewickley, to cost from $200,000 to $250,000 each. The companies are: The Osborn Bridge Co., the Stoops Ferry Bridge Co., and the Crescent Bridge Co. J. H. Craig, Chas. W. Baker and Percy L. Craig are interested.

PLYMOUTH, MASS.—A new bridge is planned over the North River, between Pembroke and Hanover. Cost, $5,000. Address County Commissioners.

SAGINAW, MICH.—Plans for the Genesee avenue bridge have been approved and sent to the Aldermen. The City Engineer estimates the cost at about $167,500. The plans call for two lift spans each 119 ft. long, of the Scherzer rolling lift type, with a 99-ft. clear waterway, two girder flanking spans 83 ft. each, two fixed spans 70 ft. each, and one fixed span 42½ ft., the west approach 142 ft., and the east approach 120 ft.

ST. JOHNS, QUE.—A bridge will be built between St. Johns and Iberville.

SAN JOSE, CAL.—Bids are wanted July 27 by the county for a bridge on the Alviso and San Jose road.

SPOKANE, WASH.—Petition has been made to the Council for a bridge at Astor street.

The Government will be asked to build a bridge costing about $100,000 over the river at Fort Wright.

STOCKTON, KAN.—Bids are wanted Aug. 12, by W. F. McNulty, County Clerk, for a bridge over Solomon river in Richland township.

TACOMA, WASH.—Bids are wanted by the City Engineer for building a drawbridge over the Puyallup River.

TIFFIN, OHIO.—Separate bids are wanted July 25 by the County Commissioners for the substructure and superstructure of a steel bridge over Rock Creek on the Coe road.

TORONTO, ONT.—H. Holgate has been appointed engineer for the new bridge to be constructed over the Rosedale ravine. The cost of the bridge will be about $30,000.

TURNER, KAN.—Bids are wanted Aug. 3, by the County Commissioners, for a bridge over Kansas River near this place.

WATERLOO, ONT.—A by-law to raise $6,000 for bridge building purposes was adopted last week.

WELLS RIVER, VT.—Press reports state that the Boston & Maine will build a bridge over the Connecticut River to Woodsville, N. H.

WOODSLEE, ONT.—Bids are wanted July 25 for building the superstructure of a steel highway bridge over Belle River.

WOONSOCKET, R. I.—Bids are wanted by Frank H. Mills, July 22, for rebuilding the Globe arch bridge at South Main street.

Other Structures.

BOONTON, N. J.—An officer of the Delaware, Lackawanna & Western tells us that the plans are not sufficiently completed to furnish details of the new station here.

CINCINNATI, OHIO.—The Cincinnati Machine Tool Co. will build a three-story building 200 ft. x 150 ft., and also a power plant.

ENSLEY, ALA.—The Tennessee Coal & Iron Co. will probably build additions to its foundry at this place. Plans are being prepared.

FORT DODGE, IOWA.—H. G. Kelley, Chief Engineer of the Minneapolis & St. Louis, reports that preparations are being made to build a freight house at this place. It is to be a concrete building 48 ft. x 200 ft.

HAMILTON, ONT.—The Grand Trunk Ry. has plans completed for new freight sheds in Hamilton, 1,180 ft. long by 40 ft. wide.

HONOLULU, HAWAIIAN ISLANDS.—Congress has appropriated $90,000 for building machine shops at the Pearl Harbor Naval station.

NEW CASTLE, IND.—The P., C., C. & St. L. and the L. E. & W. will build a new union station, and bids will be asked soon.

NORWALK, OHIO.—It is reported that the L. S. & M. S. will build a new freight house.

PHILADELPHIA, PA.—It is reported that bids are wanted for an addition 50 ft. x 100 ft. to the machine and blacksmith shop at the Park shops, on Viola street, for the Pennsylvania R. R. The addition is to have a steel frame and sheet metal sides.

PITTSBURG, PA.—The Interstate Steel Co., recently formed by people interested in the Allegheny Steel & Iron Co., and the Sheet Steel Co., has let contracts for the new mill to be built at Avenue, on the West Penn Road, near the present open hearth steel plant and sheet mills of the Allegheny Steel & Iron Co.

PORT ARTHUR, ONT.—The Canadian Northern will build two elevators at this place—a storage elevator with a capacity of 3,500,000 bushels, and a shipping elevator of 1,500,000 bushels.

SPARTANBURG, S. C.—It is reported that the Southern Ry. will build a station at this place.

TRENTON, N. J.—Local newspapers report that the Pennsylvania Railroad has bought 200 acres of land near Trenton, and the reporters feel very sure that the company intends to build very large car shops, to employ 5,000 men, but an officer of the company tells us that no new shops are to be built here at present.

RAILROAD CONSTRUCTION.

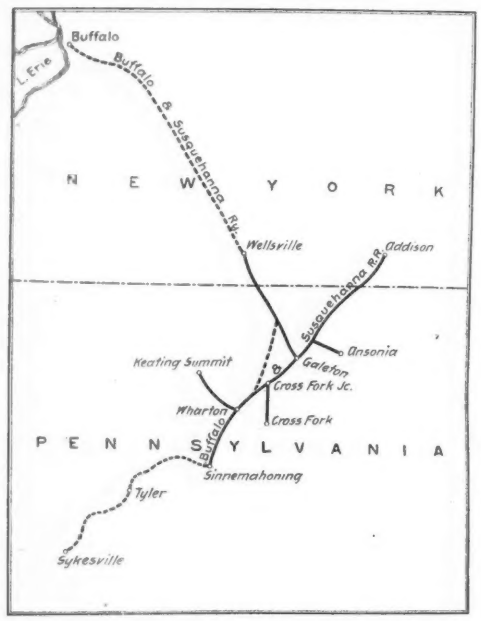
New Incorporations, Surveys, Etc.

ARKANSAS VALLEY & GULF.—A territorial charter has been granted this company, with power to build from Milton, Kan., through the Osage, Cherokee, Creek and Choctaw Indian reservations, to Texarkana, Ark., 400 miles. The company is capitalized at $4,000,000, with headquarters at Medford, Okla. T. A. A. Richards, Wellington, Kan.; T. T. Godfrey, Medford, Okla. T., and others are incorporators.

BASIN & ELLISTON.—At a recent meeting of the directors of this company it was voted to let contracts at once for building this line from Basin, Mont., to Elliston, 20 miles. C. R. Tuttle, Helena, is President, and F. G. Loft, General Manager. (May 15, p. 351.)

BELLINGHAM BAY & BRITISH COLUMBIA.—An officer writes that the contract for grading the extension of this line from Hampton, Wash., to Lynden, 5½ miles, has been let to A. C. Goerig, Everett, Wash. The work is easy, with maximum grades of 1.5 per cent., and maximum curvatures of 5 deg. The contract calls for the completion of the work in 90 days. (June 26, p. 478.)

BUFFALO & SUSQUEHANNA.—Fisk & Robinson, bankers, of New York, say, concerning the extension of this road from Wellsville, N. Y., northwest to Buffalo, 80 miles: Good progress is now being made in procuring the necessary right of way, and it is expected that contracts for grading part of the line will be let during the month of July. Work on the southern extension from Sinnemahoning, Pa., to the coal fields in Elk, Jefferson and Clearfield Counties is now being pushed forward rapidly. Grading is finished for a distance of about 14 miles south of Sinnemahoning. (See Construction Supplement.)



BURNSVILLE & EASTERN (WABASH).—An officer writes that work on this road has been suspended for an indefinite period.

CANADIAN NORTHERN.—The Dominion Government has decided to aid the extension of the Canadian Northern from Grand View to Edmonton, 620 miles, and also the line from the present terminus of the Prince Albert branch to Prince Albert, 100 miles, by guaranteeing the principal and interest on an issue of first mortgage 3 per cent. debenture bonds, to the extent of $13,000 per mile.

The Dominion Government has granted authority to this company to build the following branch lines: From Hartney, Man., in a northwesterly direction to Regina, Assiniboia; from a point on the Swan River in a westerly direction to a connection with the Saskatchewan River, and from Sterling east to Morris. (March 27, p. 239.)

CANADIAN PACIFIC.—Contract is reported let to J. D. McArthur for grading the branch line from Kirkella to Neudorf. Work will be begun at once. (See Construction Supplement.)

CHAUTAUQUA TRACTION.—Authority has been granted this company by the State Railroad Commission to build an electric line 14 miles long from Lakewood, N. Y., to Mayville. The names of incorporators are not given.

CHICAGO, ROCK ISLAND & PACIFIC.—The survey for the cut-off to straighten the main line between Des Moines and Colfax, Iowa, has been finished. Grading will be begun as soon as the double tracking on the main line which is now in progress reaches Colfax.

DAWSON, DALHART & OKLAHOMA CITY.—This company has been organized to build a line from Dawson, N. Mex., to Dalhart, Texas, 100 miles, passing through Colfax and Union Counties in New Mexico, and Dallam, Sherman, Houston and Ochiltree Counties in Texas. Surveys are reported in progress. The line will eventually be extended to Oklahoma City. J. H. Conlen, W. W. Leeman, C. F. Smith, D. C. Diltz and others, of Dalhart, Texas, are incorporators.

DONALDSONVILLE & NAPOLEONVILLE.—An officer writes to the *Manufacturers' Record* that grading is finished throughout the main line, and that track laying is progressing fast. It is expected to have the road in operation within a month. For about half its length the new line will parallel the Texas & Pacific, and will then run in a southerly direction along the west bank of the Bayou La Fourche. (May 8, p. 336.)

FLORENCE, SHEFFIELD & TUSCUMBIA (ELECTRIC).—Contract for grading this electric road has been let to T. M. Crow, Florence, Ala. The proposed route is from Florence south through Sheffield to Tuscumbia, 10 miles. According to the terms of the contract, work must be completed by the first of next December.

FOND DU LAC & NORTHEASTERN.—Articles of incorporation have been filed by this company in Wisconsin. The route of its proposed railroad is from Fond du Lac northeast through Taycheedah, Calumet, Eaton and Manitowoc Rapids to Manitowoc. W. H. Phillips, H. W. Wilson and J. E. Mullen, Fond du Lac, Wis., are interested.

GRAND TRUNK.—An officer writes that this company has let a contract to Ross & McRae, of Montreal, for grading for the second track from Sarnia tunnel to Kingscourt Junction, 22 miles. Track laying and ballasting will be done by the company's forces. The work is light and the bridges are not large. (July 10, p. 530.)

GREAT NORTHERN.—Work is reported begun on the tunnel which is to be built by this company at Seattle, Wash. When the work is completed, the trains of the Great Northern will run under the residence portion of the city, emerging from the tunnel at the harbor front in the center of the business section. The tunnel will be about 1½ miles long. (April 3, p. 256.)

IDAHO ROADS.—Press reports state that surveys are now in progress for a road from Red Rock, Mont., through Boise City, Idaho, to the Columbia River, and thence to a connection with the Oregon R. R. & Navigation Company's lines. The names of the interested parties are not stated.

LANCASTER, LOGAN & NELSONVILLE TRACTION.—Incorporation has been granted this company in Ohio to build from Lancaster southeast to Logan and Nelsonville, 20 miles. The proposed line will parallel the Hocking Valley for a part of the distance. J. W. Jones, F. M. McKay, F. E. Pierpont and others, of Columbus, Ohio, are incorporators.

MENDOTA, OTTAWA & EASTERN.—Rights of way are now being secured by this company from Mendota, Ill., southeast to Ottawa, 20 miles. Surveys have been finished and work will be begun as soon as the rights of way have all been secured. W. J. Perkins, Troy Grove, Ill., and A. P. Wasson, Amboy, Ill., are interested.

MEXICAN CENTRAL.—Press reports state that work has been resumed on the Manzanillo extension of this road between Tuxpan and Colima, 45 miles. Work was temporarily suspended on this road a few months ago on account of a severe eruption of the Mt. Colima volcano. (March 20, p. 220.)

MOBILE, JACKSON & KANSAS CITY.—Press reports state that bids are now being asked by this company for grading the extension of this line from Decatur, Miss., north to Pontotoc, 140 miles.

MONROE RAILWAY & NAVIGATION.—This company has been chartered in Louisiana, to build from Monroe southwest to Winnfield, 50 miles, with branches to Gilbert and to Bastrop. J. P. Parker, L. D. McLain and others, of Monroe, La., are interested.

MORELIA & TACAMBARO.—This company has cancelled its contract with Powell & Mason, of Baltimore, for building its line from Irapuato, on the Mexican Central, south to Morelia, and thence through Tacambaro west to Ario, 225 miles. A contract has been let to R. C. Bacon, Mexico City, for building the first 50 miles of the road. (June 26, p. 478.)

NICHOLS & NORTHERN PENNSYLVANIA.—Surveys are reported finished for this line, and rights of way are now being secured. The proposed route is from Binghamton, N. Y., southwest to Nicholson, Pa., 45 miles. Connection will be made with the Lehigh Valley at Lynn, Pa. M. P. Finch, Nichols, N. Y., and C. L. B. Tylee, Newark, N. Y., are interested. (May 22, p. 368.)

ST. LOUIS, EL RENO & WESTERN (MISSOURI, KANSAS & TEXAS).—This company has filed a notice with the Secretary of Oklahoma Territory, of an increase in capital stock from $100,000 to $1,400,000. The route of the proposed railroad is from the eastern part of Oklahoma Territory, in Lincoln County, to a point in Green County, passing through Chandler, Guthrie, El Reno, Hobart and Mangum Counties, 200 miles. A charter was granted this company in January last. Press reports state that contracts for grading will shortly be let. (See Construction Supplement.)

SOUTHERN.—Surveys have been finished on the proposed branch of this road from Jasper, Ind., to French Lick Springs, 20 miles. Grading will be begun at once. Connection will be made with the Chicago, Indianapolis & Louisville at French Lick.

SOUTHERN ILLINOIS ELECTRIC.—Articles of incorporation have been filed by this company in Illinois. It is proposed to build from East St. Louis southeast through the Counties of St. Clair, Clinton, Washington, Jefferson, Hamilton and White, all in Illinois, to a point on the Wabash River near Maunie, Ill., 120 miles. J. R. Pierce, G. F. Ward, S. T. Maxey and A. N. Johnson, of Mount Vernon, Ill., are incorporators.

TENNESSEE WESTERN.—This company has been incorporated in Tennessee, to build a railroad from Humboldt, Gibson County, west to Alamo, Crockett County, and thence in a northwesterly direction to Dyersburg, 60 miles. Preliminary surveys are now in progress. Connection will be made with the Mobile & Ohio at Humboldt, and with the Illinois Central at Dyersburg. W. H. Skivington, Pittsburg, Pa.; J. H. Connor, Nashville, and others are incorporators.

TOLEDO, ST. LOUIS & NEW ORLEANS.—Press reports state that the proposed route of this road is from Effingham, Ill., southeast via Carmi, to Paducah, Ky., with a branch from Clay City to Benton. No statement has been made as to when contracts will be let. (See Construction Supplement.)

UNION BELT LINE (TENNESSEE).—Contracts for grading 10 miles of this road have been let to Roach & Mannigan, of Memphis, Tenn. Work will be begun at once. (May 15, p. 352.)

UNION TRACTION.—Contracts have been let for grading this line from Anderson, Ind., northwest to Elwood, 15 miles, and also from Anderson southeast to New Castle, 20 miles. The line to Elwood will be built by Stilwell & Lamont, and the line to New Castle by a Chicago contracting firm. The line will parallel a line of the Pennsylvania.

VARNER, CUMMINGS & EASTERN.—Articles of incorporation have been filed by this company in Arkansas. It is proposed to build from Linwood, Jefferson County, in an easterly direction through Lincoln County to Watson, 48 miles. Connection will be made with the Memphis, Helena & Louisiana at Watson, and with the St. Louis, Iron Mountain & Southern at Linwood. J. A. Franklin is President, and J. B. Rawlins, Secretary, both of Linwood, Ark.

WESTERN MARYLAND.—An officer is reported as saying that the contract for building the extension from Cumberland, Md., to Cherry Run, 65 miles, has been awarded, but that the name of the contractor will not be announced until the contract has been drawn up and signed by both contracting parties. This extension, when completed, will be the connecting link between the West Virginia Central and the Western Maryland railroads, both of which are controlled by the Wabash. (May 29, p. 384.)

WITHEE & MAPLEHURST ELECTRIC.—Articles of incorporation have been filed by this company in Wisconsin. It is proposed to build an electric railroad from Withee to Maplehurst, in the northern part of Clark County, Wis. W. J. McElroy, E. H. Naber and others, of Milwaukee, are incorporators.

YAZOO & MISSISSIPPI VALLEY (ILLINOIS CENTRAL).—An officer writes that a cut-off 6½ miles long will be built between Etters and Lakeview, Miss., at an estimated cost of $320,000. The new road will be rock ballasted and will be laid with 85-lb. steel rails. (July 10, p. 520.)

GENERAL RAILROAD NEWS.

BALTIMORE & OHIO.—Gross earnings for this road for the fiscal year ending June 30, 1903, were $63,449,633, an increase of $5,556,022; net earnings were $23,878,674, an increase of $2,996,047. These figures include the earnings of the Baltimore & Ohio Southwestern, and all subsidiary companies excepting the Valley of Virginia, the Ohio & Little Kanawha, the Cleveland Terminal & Valley, the Cleveland, Lorain & Wheeling, the Ripley & Mill Creek Valley, and the Ravenswood, Spencer & Glenville. Including these latter companies, which are controlled and operated by the Baltimore & Ohio, the total earnings show a gross increase of $5,963,864, and a net increase of $2,789,321.

BANGOR & AROOSTOOK.—The Railroad Commission of Maine has been petitioned to approve an increase of $500,000 in the capital stock of this company. The increase is said to be for the purpose of buying the Fish River R. R., from Ashland, Me., to Fort Kent, 50 miles, which was built last year.

BUFFALO & SUSQUEHANNA RY.—Fisk & Robinson, of New York, are paying the stockholders of the Buffalo & Susquehanna Ry. Co., under the terms of their contract covering the purchase of Buffalo & Susquehanna R. R. stock, ⅝ of 1 per cent. on the par value of the stock. The Buffalo & Susquehanna Ry. was organized in September, 1902, to extend the line of the Buffalo & Susquehanna R. R. from Wellsville, N. Y., to Buffalo, 84 miles. A map of this extension is shown in the Railroad Construction columns.

CAMBRIA & CLEARFIELD.—This is the name of the new company which has been formed by the merger of the Pennsylvania & Northwestern, the Cambria & Clearfield, the Cresson & Ivona, the Tyrone & Clearfield, and the Ebensburg & Black Lick.

DELAWARE & HUDSON.—This company has purchased the Cooperstown & Charlotte Valley, which runs between Cooperstown, N. Y., and Davenport Center, five miles. The sale also includes the transfer of the Cooperstown & Susquehanna Valley, running between Cooperstown and Oneonta, 19 miles. David Wilcox, who was recently elected President of the Delaware & Hudson, is also President of the Cooperstown & Charlotte Valley.

DENVER, ENID & GULF.—A mortgage for $2,600,000 has been filed by this company with the Mississippi Valley Trust Co. as trustee. The proceeds will be used to pay for the extension from Guthrie, Okla. T., northwest through Enid to the Kansas State line, 130 miles. The road is completed between Guthrie and Enid, 57 miles.

FINDLAY, FORT WAYNE & WESTERN.—This road has been sold to Judge J. J. Moore, of New York, who, it is said, represents the interest of the Cincinnati, Hamilton & Dayton, which has been in control of the property for several years.

OZARK & CHEROKEE CENTRAL.—This company has been taken over by the St. Louis & San Francisco and will be operated as the Muskogee Division. The road extends from Fayetteville, Ark., through Westville, Fort Gibson and Muskogee to Okmulgee, 145 miles.

PERE MARQUETTE.—N. W. Harris & Co., of New York City, are offering at par and interest $1,500,000 Pere Marquette 4½ per cent. gold bonds. These bonds are a first lien on the Lake Erie & Detroit River Division, through the deposit of $3,000,000 5 per cent. first mortgage gold bonds of the Lake Erie & Detroit River R. R. Co. The bonds are dated June 1, 1903, and are due Aug. 1, 1932.

RICHFIELD & MADISON.—At a recent meeting of the directors of this company it was voted to issue $750,000 of 20-year gold bonds, the proceeds to be used in improving the road and in building a branch to Staunton, Ill. The road runs from Richfield to Madison, Ill., 44 miles, and is owned and operated by the Chicago, Peoria & St. Louis.

ST. LOUIS & SAN FRANCISCO.—See Ozark & Cherokee Central above.

ST. LOUIS SOUTHWESTERN.—This company has recently made a traffic agreement with the Texas & Pacific, under which it will run passenger trains over the Texas & Pacific between Fort Worth and Dallas, 32 miles. The price is to be 40 cents per passenger train mile. The contract may be cancelled by either party on 90 days' notice.

SAN ANTONIO & ARANSAS PASS.—The Texas Railroad Commission has modified the recent order which it made in regard to the cancellation of the bonds of this company. The company is now allowed to replace the $1,356,000 of the amount ordered cancelled, with the same amount of new bonds, on condition that within two years it shall build a railroad from a connection with its existing lines in Texas, to Brownsville.

WASHINGTON, BALTIMORE & ANNAPOLIS ELECTRIC.—Upon application of the Cleveland Construction Co., Judge Morris, of the United States District Court, has appointed James Christy, Jr., Akron, Ohio, and G. W. Williams, Baltimore, receivers for this company. The alleged complaint is that the railroad company owes the Cleveland Construction Co. $93,000, due on a contract made in May, 1902. An answer has been filed by the railroad company admitting the charges set forth in the bill and agreeing to the appointment of the receivers.